TOTAL MAXIMUM DAILY LOAD FOR TOTAL PHOSPHORUS FOR REDONDO CREEK IN THE RIO GRANDE BASIN (JEMEZ)

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State of New Mexico
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Summary Table

New Mexico Standards Segment	Rio Grande 2106
Waterbody Identifier	Redondo Creek from the mouth on Sulphur Creek to the headwaters (MRG2-40100) 5.2 miles.
Parameters of Concern	Total Phosphorus
Uses Affected	High Quality Coldwater Fishery
Geographic Location	Rio Grande Basin (Jemez)
Scope/size of Watershed	12 mi^2 (Redondo Creek)
Land Type	Ecoregions: Southern Rockies (210, 211) Arizona-New Mexico Plateau (220, 221) (USEPA 1987)
Land Use/Cover	Forest (96%), Rangeland (1%), Urban (3%)
Identified Sources	Natural and Unknown
Watershed Ownership	Forest Service (7%), Private (93%)
Priority Ranking	4
Threatened and Endangered Species	None
TMDL for: Total Phosphorus (as mg/L)	WLA(0) + LA(0.209) + MOS(0.070)=.279 **lbs./day**

Table of Contents

EXECUTIVE SUMMARY

Section 303(d) of the Federal Clean Water Act requires states to develop TMDL management plans for water bodies determined to be water quality limited. A TMDL documents the amount of a pollutant a water body can assimilate without violating a state's water quality standards. The TMDL also allocates that load capacity to known point sources and nonpoint sources at a given flow. TMDLs are defined in 40 CFR Part 130 as the sum of the individual Waste Load Allocations (WLA) for point sources and Load Allocations (LA) for nonpoint sources, including a margin of safety and natural background conditions.

The Jemez River Basin is a sub-basin of the Rio Grande Basin, located in northcentral New Mexico. Headwater tributaries to the Jemez River include Redondo Creek from the mouth on Sulphur Creek to its headwaters. The US Geological Survey and the Surface Water Quality Bureau have water quality stations located on Redondo Creek at the USDA FS-Baca Boundary (private land) and above the confluence with Sulphur Creek. This monitoring effort documented several exceedances of New Mexico water quality standards for total phosphorus. This Total Maximum Daily Load (TMDL) document addresses this constituent for Redondo Creek.

A general implementation plan for activities to be established in the watershed is included in this document. The Surface Water Quality Bureau's Nonpoint Source Pollution Section will further develop the details of this plan. Implementation of recommendations in this document will be done with full participation of all interested and affected parties. During implementation, additional water quality data will be generated. As a result, targets will be re-examined and potentially revised; this document is considered to be an evolving management plan. In the event that new data indicate that the targets used in this analysis are not appropriate or if new standards are adopted, the load capacity will be adjusted accordingly. When water quality standards have been achieved, the reach will be removed from the TMDL list.

List of Abbreviations

BMP	**Best Management Practice**
CFR	**Code of Federal Regulations**
CFS	**Cubic Feet per Second**
CWA	**Clean Water Act**
CWAP	**Clean Water Action Plan**
EPA	**Environmental Protection Agency**
FS	**The US Department of Agriculture Forest Service**
HQCWF	**High Quality Coldwater Fishery**
LA	**Load Allocation**
MGD	**Million Gallons per Day**
mg/L	**Milligrams per Liter**
MOS	**Margin of Safety**
MOU	**Memorandum of Understanding**
NMED	**New Mexico Environment Department**
NPDES	**National Pollutant Discharge Elimination System**
NPS	**Nonpoint Sources**
SWQB	**Surface Water Quality Bureau**
TMDL	**Total Maximum Daily Load**
TP	**Total Phosphorus**
TSS	**Total Suspended Solids**
UWA	**Unified Watershed Assessment**
USGS	**The US Geological Survey**
WLA	**Waste Load Allocation**
WQLS	**Water Quality Limited Segment**
WQCC	**New Mexico Water Quality Control Commission**
WQS	**Water Quality Standards (20 NMAC 6.1)**

Background Information

The Jemez River Basin is a sub-basin of the Rio Grande Basin, located in northcentral New Mexico. This 1043 mi^2 watershed is dominated by both forest and rangeland (Figure 1) on Forest Service, Tribal, and private land. Formed by a large volcanic complex, the Jemez mountains are a geothermal reservoir created by cooling magma. Headwater tributaries to the Jemez River include Redondo Creek which originates on the Baca Land Grant, location #1 (SWQB/NMED 1987). Redondo Creek drains a small basin in the Valles Caldera, a region of tertiary and quartenary volcanic origin. It's watershed drainage area is 12 mi^2 located primarily on private (93%) and Forest Service land (7%).

The Redondo Creek stream reach is from the mouth on Sulphur Creek to the headwaters. Data collected at surface water quality monitoring stations were used to characterize the water quality of this stream reach (Figure 2). This monitoring effort documented several exceedances of New Mexico water quality standards for total phosphorus. This TMDL is for total phosphorus on Redondo Creek from the confluence with Sulphur Creek to its headwaters.

Endpoint Identification

Target Loading Capacity

Target values for total phosphorus will be determined based on 1) the presence of numeric criteria, 2) the degree of experience in applying the indicator and 3) the ability to easily monitor and produce quantifiable and reproducible results.

The Jemez River and all its tributaries (including Redondo Creek) above State highway 4 near the town of Jemez springs and the Guadalupe River and its tributaries make up waterbody segment 2106. The designated uses for this reach are domestic water supply, fish culture, high quality coldwater fishery, irrigation, livestock watering, wildlife habitat, and secondary contact. The standards are as follows:

1. In any single sample: conductivity shall not exceed 400 umhos, pH shall be within the range of 6.6 to 8.8, temperature shall not exceed 20 C (68F), and turbidity shall not exceed 25 NTU. The use-specific numeric standards set forth in Section 3101 are applicable to the designated uses listed above in Section 2106.
2. The monthly geometric mean of fecal coliform bacteria shall not exceed 100/100 ml; no single sample shall exceed 200/100 ml (see Section 1103B) (NMWQCC 1995b).

In addition, The State of New Mexico water quality standards (see Section 3101.C) (NMWQCC 1995b) establish for all streams classified as a high quality coldwater fishery, a numeric criterion for total phosphorus of 0.1 mg/L.

Total Phosphorus

The chemistry of phosphorus is such that most of the phosphorus entering into aquatic systems will be either sorbed onto soil particles or incorporated into organic compounds. Any unbound phosphate ions that enter into streams are readily taken up by aquatic plants and microorganisms. The rapid biological uptake and ease of chemical bonding explain why phosphate concentrations

in natural waters are very low (EPA 1991). Thus, soil erosion can be a primary source of phosphorus entering a waterbody (EPA 1991). A moderate correlation exists between turbidity and TSS using a linear regression of the Redondo Creek data (R^2=0.677)(Appendix A). However, soil erosion does not appear to be the source of total phosphorus in this watershed; no correlation (R^2=-0.063) was documented between TSS and total phosphorus for Redondo Creek (Appendix B). As well, there was a weak correlation (R^2=0.208) between turbidity and total phosphorus (Appendix C). Therefore, total phosphorus concentrations in the stream can not be linked to sediment loading. The observed water quality standard exceedances for total phosphorus must be from other sources in the watershed.

Figure 1

Jemez Watershed - #13020202
Land Use/Cover - TMDLs

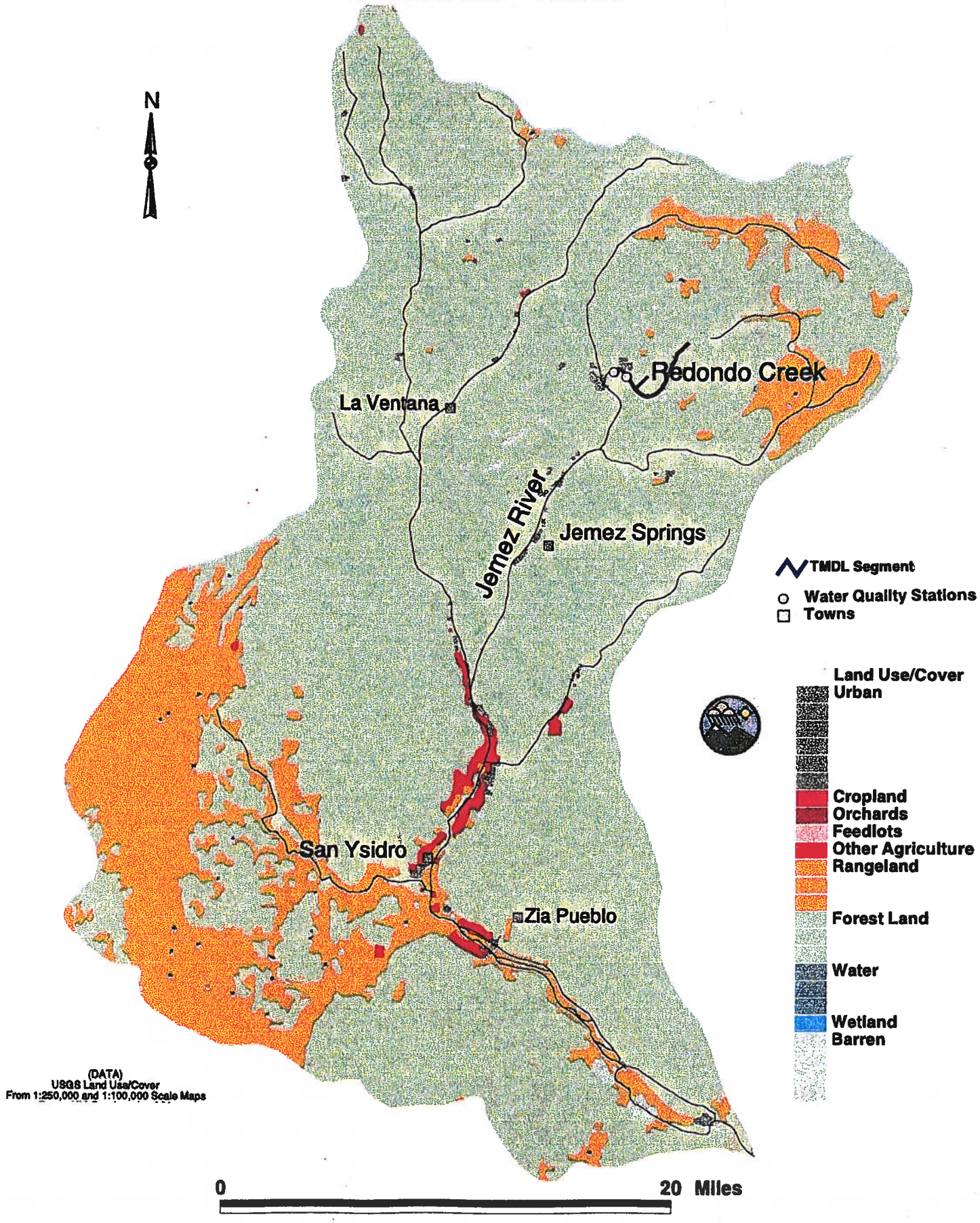
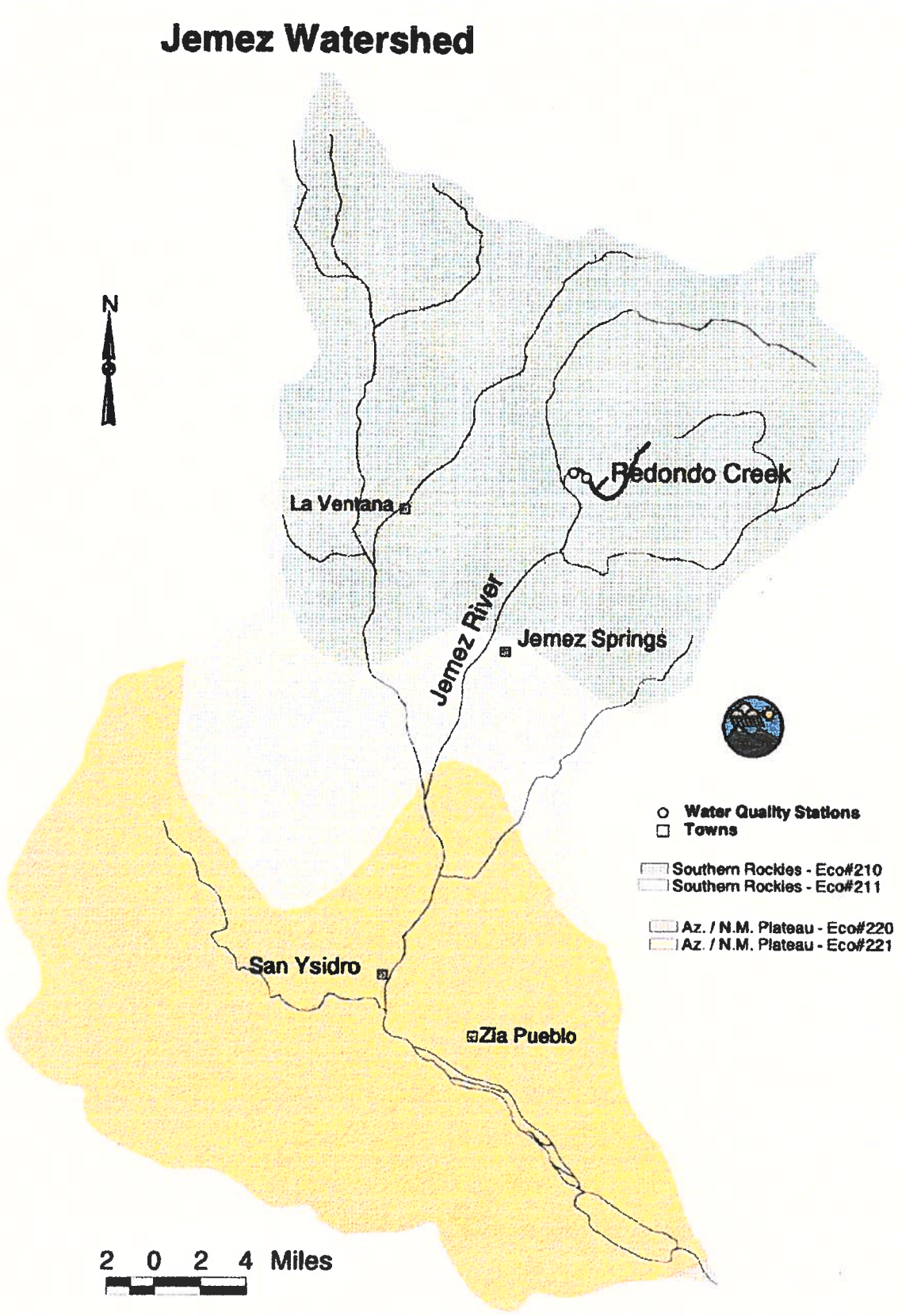


Figure 2


Jemez Watershed
N
Redondo Creek
La Ventana
Jemez River
Jemez Springs
San Ysidro
Zia Pueblo
Water Quality Stations
Towns
Southern Rockies - Eco#210
Southern Rockies - Eco#211
Az. / N.M. Plateau - Eco#220
Az. / N.M. Plateau - Eco#221
2 0 2 4 Miles

Flow

This TMDL is calculated for Redondo Creek at a specific flow. When available, US Geological Survey gages are used to estimate flow. Where gages are absent, geomorphologic cross sectional information is taken at each site and the flows are modeled. Water quality samples for total phosphorus were taken at the cross section. The cross section and water quality sampling stations were located near the confluence with Sulphur Creek (Figure 2). It is important to remember that the TMDL is a planning tool to be used to achieve water quality standards. Since flows vary throughout the year in these systems, the target load will vary based on the changing flow. Management of the load should set a goal at water quality standards attainment; not meeting the calculated target load.

Calculations

Gaged streamflow data is not available for Redondo Creek. Exceedances of water quality standards for total phosphorus were documented by the SWQB during spring and summer periods, mainly during low flow events. Therefore, high flow events (i.e. bankfull stage) will not be incorporated into this TMDL. The primary source of phosphorus to this system is attributed to nonpoint sources. Under these conditions, NMED procedures call for the calculation of stream discharge from Equation 1(USGS 1982), and the channel cross-section analyzer WinXSPRO® (FS 1998).

Following USGS (1982), average discharge is calculated using the regression equation in *Equation 1.* $Q_A=64W_{ac}^{1.88}$

Q_A=acre-feet/year, W_{ac}=width of the active channel (width at bankfull) (Appendix E).

Utilizing the Redondo Creek cross section in Appendix F, the width of Redondo Creek at bankfull is 3.05ft. Applying Equation 1 yields a calculated volume or flow of 520.79 acre/feet year or .718 cfs (Appendix D).

$Q_A=64(3.05)^{1.88}$
$Q_A=64 \times 8.136$
Q_A=520 acre feet/year
=1.426 acre feet day
=1.426/2.00 acres
=.718 cfs(+/-.20) (standard error +/- 28%)

With a standard error of +/-28%, the estimated average discharge ranges from 0.518-0.918 cfs. This calculation overlaps with the low end of the WinXSPRO® model calculated @ 1/3 bankfull depth (0.5ft) for an estimate of average daily flow according to Leopold et al. (1994, 1964)(Appendix D).

Target and measured loads for total phosphorus expressed in lbs./day will be calculated from the lower end of the standard error of the estimated mean average discharge for Redondo Creek 0.518 cfs (Appendix D).

Average discharge is defined as that flow rate which if continued every day of the year, would yield the observed annual volume of water. The average discharge usually fills a channel to approximately one-third of the channel depth, and this flow rate is equaled or exceeded approximately 25% of the days in a year (Leopold et al. 1964). Average discharge is characterized by four attributes, which make it ideal for TMDL modeling:

1. Approximately 75% of the time, flows are less than the average discharge.
2. Volume carried by these flows amounts to only 25% of the annual volume.
3. It can be easily modeled.
4. It's the discharge average for 365 days (one year).

The target load or (TMDL) for total phosphorus was calculated using the lower range of the standard error of the estimated mean for average discharge for Redondo Creek (0.518 cfs) as the critical flow and the current standard for total phosphorus (0.1 mg/L). This target load will determine the maximum loading per day into Redondo Creek that will not result in an exceedance of the total phosphorus standard. This target load was calculated using Equation 2 and is in Table 1:Calculation of Load Allocation.

Equation 2. *critical flow (mgd) x standard (mg/L) x 8.34 (conversion factor) = target loading capacity*

Table 1: Calculation of Target Loads

Location	Flow + (mgd)	Standards	Conversion Factor *	Target Load Capacity (lbs./day)
Redondo Creek	0.335	0.10 mg/L	8.34	0.279 (lbs./day)

+Flow is estimated at the low end of the standard error of mean average discharge using USGS (1982) and FS (1998).
*see Appendix G Conversion Factor Derivation

The measured loads were calculated using Equation 2. In order to achieve comparability between the target and measured loads, the flows used were the same for both calculations for critical flow. The geometric mean of the data that exceeded the standards from the data collected at each site was substituted for the standard in Equation 1. The same conversion factor of 8.34 was used. Results are presented in Table 2.

Background loads were not possible to calculate in this watershed. A reference reach, having similar stream morphology and flow, was not found. It is assumed that a portion of the load allocation is made up of natural background loads. In future water quality surveys, finding a suitable reference reach will be a priority.

Table 2: Calculation of Measured Loads

Location	Flow + (mgd)	Geometric Mean* (mg/L)	Conversion Factor	Measured Load
Redondo Creek	0.335	0.274	8.34	0.766 (lbs./day)

+Flow is estimated at the low end of the standard error of mean average discharge using USGS (1982) and FS (1998).

*geometric mean is calculated from the number (n=3) of total phosphorus exceedances collected by SWQB in 1998.

Waste Load Allocations and Load Allocations

•*Waste Load Allocation*

There are no point source contributions associated with this TMDL. The waste load allocation is zero.

•*Load Allocation*

In order to calculate the Load Allocation (LA), the waste load allocation and margin of safety were subtracted from the target capacity (TMDL) following Equation 3.

Equation 3. $WLA + LA + MOS = TMDL$

Results are in Table 3: Calculation of TMDLs for total phosphorus.

Table 3: Calculation of TMDL for Total Phosphorus

Location	WLA (lbs./day)	LA (lbs./day)	MOS (25%) (lbs./day)	TMDL (lbs./day)
Redondo Creek	0	0.209	0.070	0.279

The load reductions that would be necessary to meet the target loads were calculated to be the difference between the target load (Table 1) and the measured load (Table 2). Results follow in Table 4: Calculation of Load Reductions.

Table 4: Calculation of Load Reductions for Total Phosphorus (lbs./day)

Location	Target Load	Measured Load	Load Reductions
Redondo Creek	0.209	0.766	0.557

Identification and Description of pollutant source(s)

Table 5: Pollutant Source Summary

Pollutant Sources	**Magnitude** Load Allocation	**Location**	**Potential Sources** (% from each)
Point: None	0	--------	0%
Nonpoint: • Total Phosphorus (in lbs./day)	0.279		100% Natural Unknown

Linkage of Water Quality and Pollutant Sources

Where available data are incomplete or where the level of uncertainty in the characterization of sources is large, the recommended approach to TMDLs requires the development of allocations based on estimates utilizing the best available information.

SWQB fieldwork includes an assessment of the potential sources of impairment (SWQB/NMED 1999a). The Pollutant Source(s) Documentation Protocol, shown as Appendix H, provides an analysis for a visual evaluation of the source along an impaired reach. Although this procedure is subjective, SWQB feels that it provides the best available information for the identification of potential sources of impairment in this watershed. Table 5 (Pollutant Source Summary) identifies and quantifies potential sources of point and nonpoint source impairments along each reach as determined by field reconnaissance and assessment. A further explanation of the sources follows.

Redondo Creek

According to *Soils of New Mexico* (1978), soils in the Redondo Creek watershed are dominantly neutral to slightly acidic and are well drained and productive, supporting good stands of native vegetation. This report states that for the Redondo Creek watershed, soils have a very high organic content and are affected by fluctuating water tables. High organic matter content can characterize some soils in the Eutroboralfs-Haploborolls association found in this watershed. Therefore, natural sources of phosphorus in the soil are most likely contributing to the phosphorus concentration in the stream.

Elk and other wildlife are found throughout the watershed. These animals can represent a potentially important source of phosphate contributions. Animal waste can directly impair water quality through bacterial contamination and increasing nutrient levels.

The majority of the watershed (approximately 93%) drains private land. Domestic livestock grazing occurs throughout the watershed, which may contribute to phosphate loading.

Margin of Safety (MOS)

TMDLs should reflect a margin of safety based on the uncertainty or variability in the data, the point and nonpoint source load estimates, and the modeling analysis. For this TMDL, there will be no margin of safety for point sources, since there are none. However, for the nonpoint sources the margin of safety is estimated to be an addition of **25%** of the TMDL. This margin of safety incorporates several factors:

- *Errors in calculating NPS loads*

  A level of uncertainty exists in the relationship between background total phosphorus loading from natural and unknown sources. Soils in the Redondo Creek watershed have a high organic content and may be contributing to the total phosphorus concentrations in the stream. As well, a majority of the watershed is located on private land. The contribution of total phosphorus loading from domestic livestock grazing and other activities on private land is not clear. There is also a potential to have errors in measurements of nonpoint source loads due to equipment accuracy, time of sampling etc. Accordingly, a conservative margin of safety increases the TMDL by **25%**.

- *Errors in calculating flow*

  Flow estimates were based on estimated mean average discharge using USGS 1982, and cross sectional information utilizing WinXSPRO®. During low flow conditions; documented total phosphorus exceedances occurred, critical flow is a conservative condition set during low flow (average discharge) periods. The standard error of estimated mean average discharge is 28%. Conservative values were used to calculate loads and do not warrant additional MOS.

Consideration of seasonal variation

Data used in the calculation of this TMDL were collected during spring, summer, and fall in order to ensure coverage of any potential seasonal variation in the system. Exceedances of water quality standards for total phosphorus were documented by the SWQB during spring and summer periods, mainly during low flow events. Since the critical condition is set to estimated mean average discharge, all data were used in determining the target capacities. Therefore, it can be assumed that if the critical condition is being met, coverage of any potential seasonal variation will also be met.

Monitoring Plan

Pursuant to Section 106(e)(1) of the Federal Clean Water Act, the SWQB has established appropriate monitoring methods, systems and procedures in order to compile and analyze data on the quality of the surface waters of New Mexico. In accordance with the New Mexico Water Quality Act, the SWQB has developed and implemented a comprehensive water quality monitoring strategy for the surface waters of the State. The monitoring strategy establishes the methods of identifying and prioritizing water quality data needs, specifies procedures for acquiring and managing water quality data, and describes how these data are used to progress toward three basic monitoring objectives: to develop water quality-based controls, to evaluate the effectiveness of such controls, and to conduct water quality assessments.

The SWQB utilizes a rotating basin system approach to water quality monitoring. In this system, a select number of watersheds are intensively monitored each year with an established return frequency of every five years.

The SWQB maintains current quality assurance and quality control plans to cover all monitoring activities. This document "Quality Assurance Project Plan for Water Quality Management Programs" (QAPP) is updated annually.

Current priorities for monitoring in the SWQB are driven by the 303(d) list of streams requiring TMDLs. Short-term efforts will be directed toward those waters which are on the EPA TMDL consent decree list (Forest Guardians and Southwest Environmental Center v. Carol Browner, Administrator, US EPA, Civil Action 96-0826 LH/LFG, 1997) and which are due within the first two years of the monitoring schedule. Once assessment monitoring is completed those reaches still showing impacts and requiring a TMDL will be targeted for more intensive monitoring. The methods of data acquisition include fixed-station monitoring, intensive surveys of priority water bodies, including biological assessments, and compliance monitoring of industrial, federal and municipal dischargers. These methods are specified in the Assessment Protocol (SWQB/NMED 1998a).

Long term monitoring for assessments will be accomplished through the establishment of sampling sites that are representative of the waterbody and which can be revisited every five years. This gives an unbiased assessment of the waterbody and establishes a long term monitoring record for simple trend analyses. This information will provide time relevant information for use in 305(b) assessments and to support the need for developing TMDLs.

This approach provides:

- a systematic, detailed review of water quality data which allows for a more efficient use of monitoring resources.
- information at a scale where implementation of corrective activities is feasible.
- an established order of rotation and predictable sampling in each basin, which allows for enhanced coordinated efforts with other programs.
- program efficiency and improves the basis for management decisions.

It should be noted that a basin will not be ignored during its four year sampling hiatus. The rotating basin program will be supplemented with other data collection efforts which will be classified as field studies. This time will be used to analyze the data collected, conduct field studies to further characterize identified problems, and develop and implement TMDLs. Both types of monitoring, long term and field studies, can contribute to the §305(b) and §303(d) listing processes, but they should be stored in the primary database with distinguishing codes which will allow separate data retrievals.

The following schedule is a draft for the sampling seasons through 2002 and will be followed in a consistent manner to support the New Mexico Unified Watershed Assessment (UWA) and the

Nonpoint Source Management Program. This sampling regime will reflect seasonal variation and include sampling in spring, summer, and fall for each of the watersheds.

1998 - Jemez, Chama (above El Vado), Cimarron (above Springer), Santa Fe, San Francisco
1999 - Chama (below El Vado), middle Rio Grande, Gila, Red River
2000 - Mimbres, Dry Cimarron, upper Pecos (headwaters to Ft. Sumner), upper Rio Grande (part1)
2001 - Upper Rio Grande (part 2), lower Pecos (Roswell south), Closed Basins, Zuni
2002 - Canadian Basin, lower Rio Grande, San Juan, Rio Puerco

Implementation plan

Management Measures

Management measures are "economically achievable measures for the control of the addition of pollutants from existing and new categories and classes of nonpoint sources of pollution, which reflect the greatest degree of pollutant reduction achievable through the application of the best available nonpoint pollution control practices, technologies, processes, siting criteria, operating methods, or other alternatives" (USEPA 1993). A combination of best management practices (BMPs) will be used to implement this TMDL. BMPs in this area will *include riparian restoration where needed. Good range management will be encouraged along the entire reach. SWQB will work with private land owners and the FS to encourage the implementation of BMPs such as: riparian restoration, streambank stabilization, and good range management where needed.*

Presently, the FS is addressing several sources of NPS pollution that originate on properties managed by the FS in the Jemez watershed. Such activities and proposals include: timber thinning and prescribed fire to prevent catastrophic wildfires and to improve groundcover and watershed conditions, improved grazing management, road closures, relocation of roads out of riparian areas to exclude livestock and vehicles. The SWQB will continue coordination with the FS in implementing BMPs in this watershed.

Public outreach and stakeholder involvement in the implementation of this TMDL will be ongoing. Stakeholder participation will include choosing and installing BMPs, as well as potential volunteer monitoring. Stakeholders in this process will include: SWQB, FS, local government, private land owners, tribes, environmental groups, and the general public.

Time Line

Implementation Actions	Year 1	Year 2	Year 3	Year 4	Year 5
Public Outreach and Involvement	X	X	X	X	X
Establish Milestones	X				
Secure Funding	X		X		
Implement Management Measures (BMPs)		X	X		
Monitor BMPs		X	X	X	
Determine BMP Effectiveness				X	X
Re-evaluate Milestones				X	X

Assurances

New Mexico's Water Quality Act does not contain enforceable prohibitions directly applicable to nonpoint sources of pollution. The Act does authorize the Water Quality Control Commission to "promulgate and publish regulations to prevent or abate water pollution in the state" and to require permits. The Water Quality Act (20 NMAC 6.2) (NMWQCC 1995a) also states in §74-6-12(a):

> *The Water Quality Act (this article) does not grant to the commission or to any other entity the power to take away or modify the property rights in water, nor is it the intention of the Water Quality Act to take away or modify such rights.*

In addition, The State of New Mexico water quality standards (see Section 1100E and Section 1105C) (NMWQCC 1995b) states:

> *These water quality standards do not grant the Commission or any other entity the power to create, take away or modify property rights in water.*

New Mexico policies are in accordance with the federal Clean Water Act §101(g):

> *It is the policy of Congress that the authority of each state to allocate quantities of water within its jurisdiction shall not be superseded, abrogated or otherwise impaired by this Act. It is the further policy of Congress that nothing in this Act shall be construed to supersede or abrogate rights to quantities of water which have been established by any State. Federal agencies shall co-operate with State and local agencies to develop comprehensive solutions to prevent, reduce, and eliminate pollution in concert with programs for managing water resources.*

NMED nonpoint source water quality improvement work utilizes a voluntary approach. This provides technical support and grant money for the implementation of best management practices and other NPS prevention mechanisms through §319 of the Clean Water Act. Since this TMDL

will be implemented through NPS control mechanisms the New Mexico Nonpoint Source Program is targeting efforts to this watersheds. The Nonpoint Source Program coordinates with the Nonpoint Source Taskforce. The Nonpoint Source Taskforce is the New Mexico statewide focus group representing federal and state agencies, local governments, tribes and pueblos, soil and water conservation districts, environmental organizations, industry, and the public. This group meets on a quarterly basis to provide input on the Section 319 program process, to disseminate information to other stakeholders and the public regarding nonpoint source issues, to identify complementary programs and sources of funding, and to help review and rank Section 319 proposals.

In order to ensure reasonable assurances for implementation in watersheds with multiple landowners, including Federal, State and private, NMED has established MOUs with several Federal agencies, in particular the Forest Service and the Bureau of Land Management. These MOUs provide for coordination and consistency in dealing with nonpoint source issues.

New Mexico's Clean Water Action Plan has been developed in a coordinated manner with the State's 303(d) process. All Category I watersheds identified in New Mexico's Unified Watershed Assessment process are totally coincident with the impaired waters list for 1996 and 1998 approved by EPA. The State has given a high priority for funding assessment and restoration activities to these watersheds.

The time required to attain standards for all reaches is estimated to be approximately 10-20 years. This is based on a five-year time frame implementing several watershed projects that may not be starting immediately or may be in response to earlier projects. The cooperation of private landowners and Federal Agencies will be pivotal in the implementation of this TMDL.

Milestones

Milestones will be used for determining if control actions are being implemented and standards attained. For this TMDL several milestones will be established such as a reduction in total phosphorus concentrations within a certain time frame. These milestones will vary based on the BMPs implemented at each site. Another milestone will be to update or develop MOUs with other state and federal agencies by 2001 to ensure protection and restoration in this watershed, and to increase education and outreach activities regarding total phosphorus concentrations in this watershed, particularly for private landowners.

Milestones will be reevaluated periodically, depending on what BMP was implemented. Further implementation of this TMDL will be revised based on this reevaluation. The process will involve: monitoring pollutant loading, tracking implementation and effectiveness of controls, assessing water quality trends in the waterbody, and reevaluating the TMDL for attainment of water quality standards.

Public Participation

Public participation was solicited in development of this TMDL. See Appendix I for flow chart of the public participation process. The draft TMDL was made available for a 30-day comment period starting *(August 10, 1999)*. Response to comments is attached as Appendix J of this document. The draft document notice of availability was extensively advertised via newsletters, email distribution lists, webpage postings (http://www.nmenv.state.nm.us), and press releases to area newspapers.

References Cited

Agricultural Experiment Station. 1978. Research Report 285 Soils of New Mexico. New Mexico State University. 123pp.

Forest Guardians and Southwest Environmental Center v. Carol Browner, Administrator, US EPA, Civil Action 96-0826 LH/LFG, 1997.

Leopold, L.B., Wolman, M.G., and Miller, J.P. 1964. Fluvial Processes in Geomorphology. W.H. Freeman and Co. San Francisco, CA. 511pp.

Leopold, L.B. 1994. A View of the River. Harvard University Press, Cambridge, Mass. 298pp.

NMWQCC. 1995a. State of New Mexico Ground and Surface Water Quality Protection Regulations (20 NMAC 6.2). Santa Fe, NM.

NMWQCC. 1995b. State of New Mexico Standards for Interstate and Intrastate Streams. Santa Fe, NM.

SWQB/NMED. 1999a. Draft Pollutant Source Documentation Protocol.

SQWB/NMED. 1999b. Quality Assurance Project Plan for Water Quality Management Plans.

SWQB/NMED. 1998. State of New Mexico Procedures for Assessing Standards Attainment for 303(d) List and 305(b) Report Assessment Protocol.

SWQB/NMED. 1987. Intensive Water Quality Survey of the Jemez River and it's Tributaries in Sandoval County, NM. 59pp.

US EPA. and James Omernik. 1987. Ecoregions of the South Central States. Environmental Research Laboratory, Corvallis, Oregon.

US EPA. 1993. Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters. EPA-840-B-92-002. Washington, D.C.

US EPA. 1991. Monitoring Guidelines to Evaluate Effects of Forestry Activities on Streams in the Pacific Northwest and Alaska. EPA-910-9-91-001. Seattle, WA. 166pp.

USDA FS. 1998. WinXSPRO A Channel Cross-Section Analyzer. West Consultants Inc. San Diego, CA. 97pp.

USGS. 1983. Streamflow Characteristics Related to Channel Geometry of Streams in Western United States. Water Supply Paper 2193. Albuquerque, NM. 17pp.

Appendices

Appendix A: Relationship between Turbidity and Total Suspended Solids for Redondo Creek.

Appendix B: Relationship between Total Suspended Solids and Total Phosphorus for Redondo Creek.

Appendix C: : Relationship between Turbidity and Total Phosphorus for Redondo Creek.

Appendix D: Estimated Average Discharge for Redondo Creek.

Appendix E: Equation for Determining Mean Annual Runoff for Streams in the Western U.S.

Appendix F: Redondo Creek Cross Section.

Appendix G: Conversion Factor Determination.

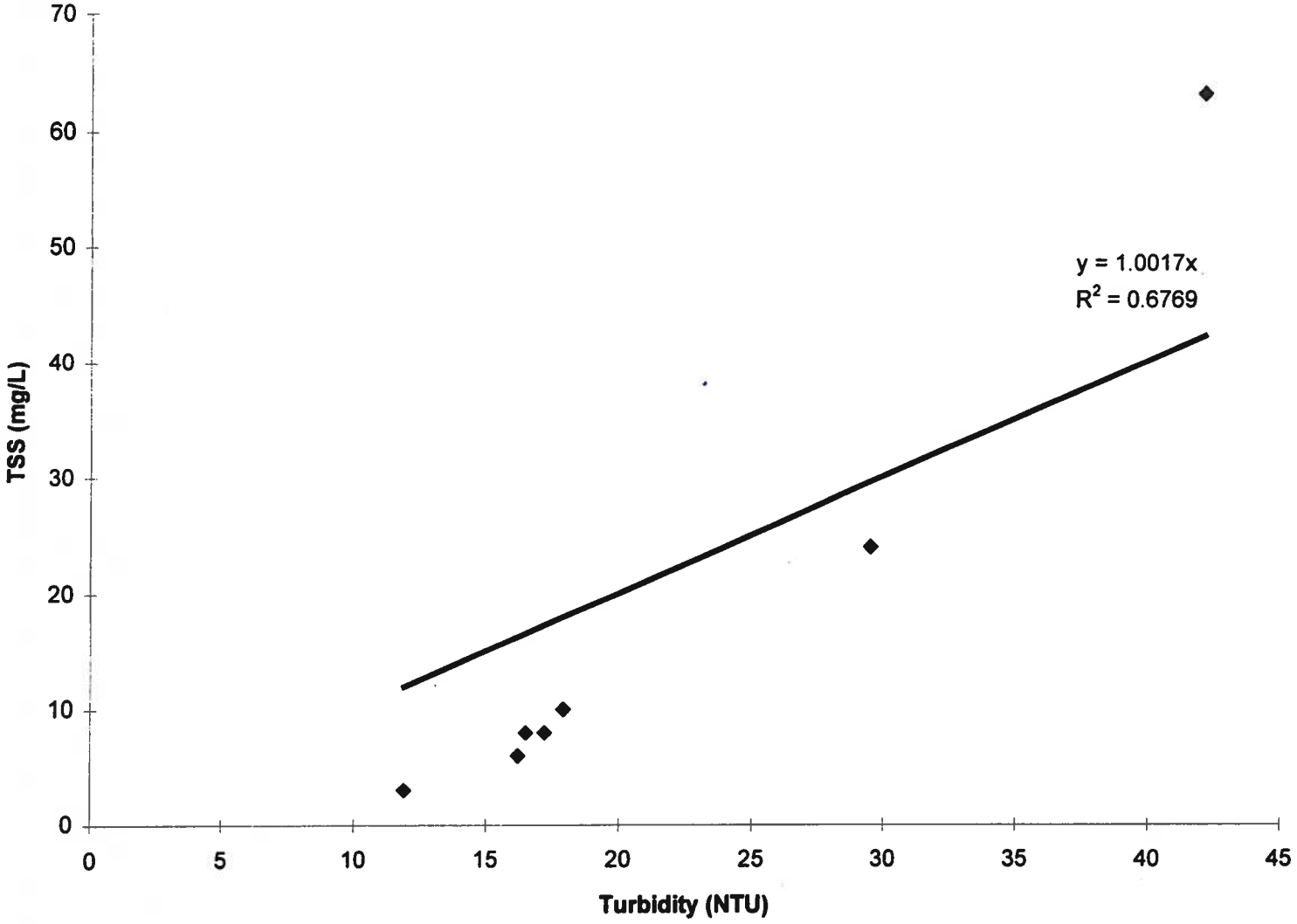
Appendix H. Pollutant Source(s) Documentation Protocol.

Appendix I: Flow Chart of the Public Participation Process

Appendix J: Response to Comments

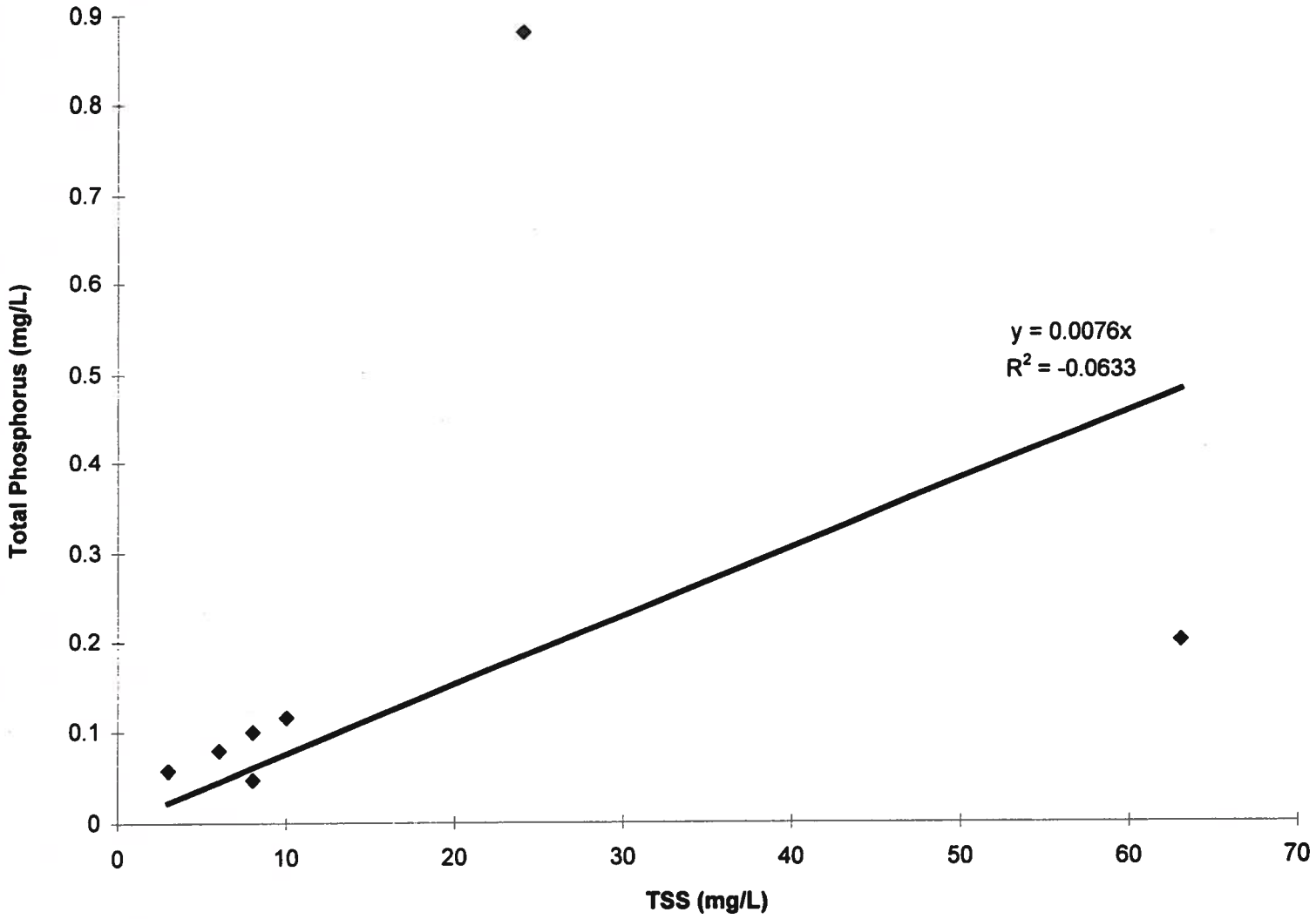
Appendix A: Relationship between Turbidity and Total Suspended Solids for Redondo Creek

TSS vs Turbidity for Redondo Creek

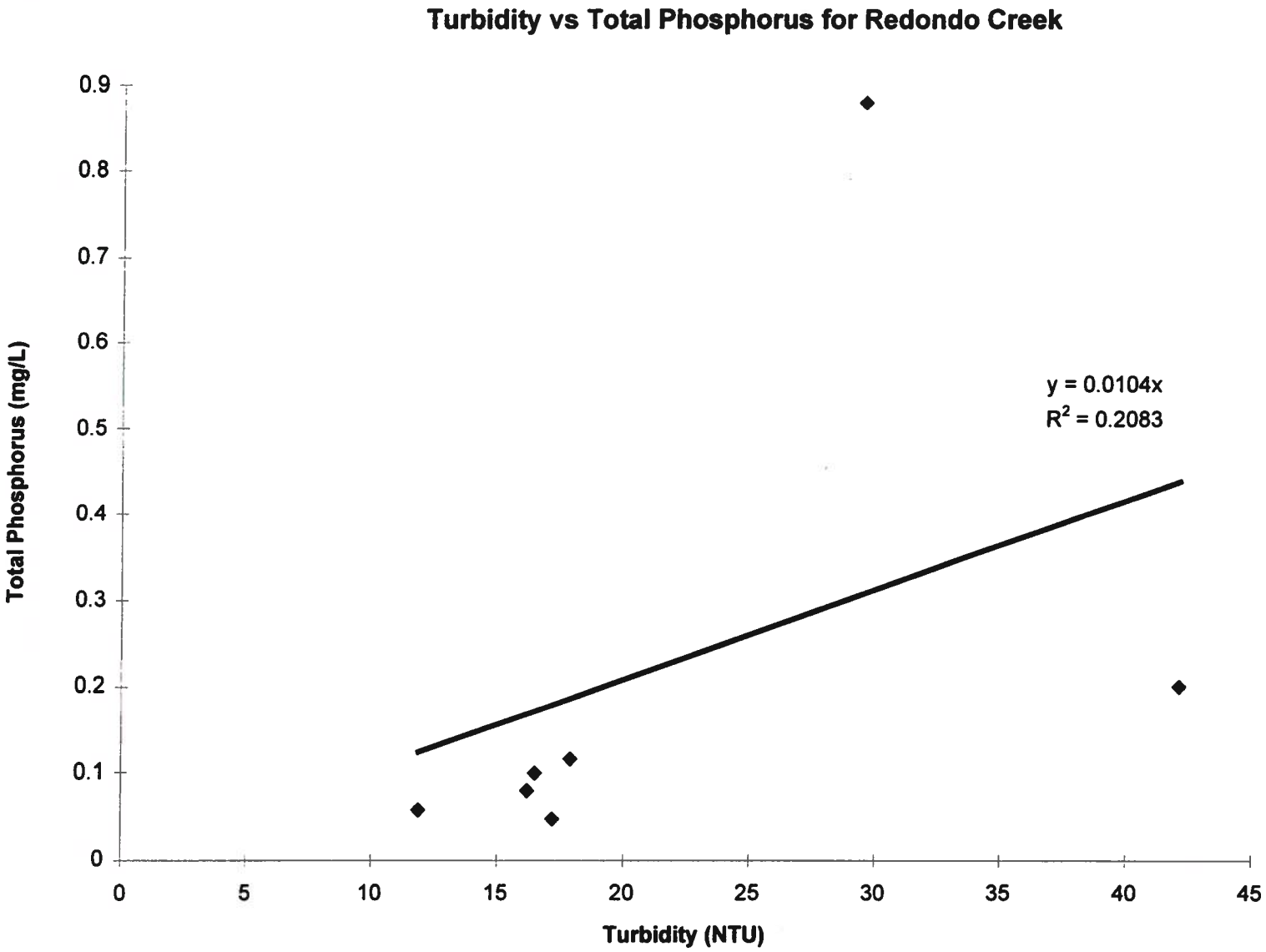


Appendix B: Relationship between Total Suspended Solids and Total Phosphorus for Redondo Creek

TSS vs Total Phosphorus For Redondo Creek



Appendix C: Relationship between Turbidity and Total Phosphorus for Redondo Creek


Turbidity vs Total Phosphorus for Redondo Creek
Total Phosphorus (mg/L)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
y = 0.0104x
R2 = 0.2083
0
5
10
15
20
25
30
35
40
45
Turbidity (NTU)

Appendix D: Estimated Average Discharge for Redondo Creek

**********WinXSPRO**********

redondo.out

Input File: C:\WXSPRO20\REDONDO.DAT
Run Date: 07/01/99
Analysis Procedure: Hydraulics
Cross Section Number: 1
Survey Date: 06/28/99

Subsections/Dividing stations
A / 46.69/ B

Resistance Method: Thorne and Zevenbergen
D84: 60.000 mm

$Q_A = 64\ AC^{1.88}$

$Q_A = 64\ (3.05)^{1.88}$

$Q_A = 64 \times 8.136$

$Q_A = 520$ Acre-Feet/yr

$= 1.426$ Acre Feet/day

$\frac{1.426\ \text{Acre-ft}}{2{,}060\ \text{Acre-ft}} = .718$ CFS $\pm .20$ (SE)

1/3 bankfull

STAGE (ft)	*SEC	AREA (sq ft)	PERIM (ft)	WIDTH (ft)	R (ft)	DHYD (ft)	SLOPE (ft/ft)	n	VAVG (ft/s)	Q (cfs)
0.29	T	0.55	2.76	2.61	0.20	0.21	0.014	0.064	0.95	0.52
0.30	T	0.58	2.78	2.62	0.21	0.22	0.014	0.063	0.99	0.57
0.31	T	0.61	2.80	2.62	0.22	0.23	0.014	0.061	1.04	0.63
0.32	T	0.63	2.82	2.63	0.22	0.24	0.014	0.060	1.08	0.68
0.33	T	0.66	2.84	2.63	0.23	0.25	0.014	0.059	1.13	0.74
0.34	T	0.68	2.86	2.64	0.24	0.26	0.014	0.058	1.17	0.80
0.35	T	0.71	2.88	2.65	0.25	0.27	0.014	0.057	1.22	0.86
0.36	T	0.74	2.90	2.65	0.25	0.28	0.014	0.056	1.26	0.93
0.37	T	0.76	2.92	2.66	0.26	0.29	0.014	0.056	1.30	0.99
0.38	T	0.79	2.94	2.66	0.27	0.30	0.014	0.055	1.34	1.06
0.39	T	0.82	2.96	2.67	0.28	0.31	0.014	0.054	1.38	1.13
0.40	T	0.84	2.98	2.67	0.28	0.32	0.014	0.054	1.42	1.20
0.41	T	0.87	3.01	2.68	0.29	0.32	0.014	0.053	1.46	1.27
0.42	T	0.90	3.03	2.69	0.30	0.33	0.014	0.053	1.50	1.35
0.43	T	0.92	3.05	2.69	0.30	0.34	0.014	0.052	1.54	1.43
0.44	T	0.95	3.07	2.70	0.31	0.35	0.014	0.052	1.58	1.50
0.45	T	0.98	3.09	2.70	0.32	0.36	0.014	0.051	1.62	1.58
0.46	T	1.01	3.11	2.71	0.32	0.37	0.014	0.051	1.66	1.66
0.47	T	1.03	3.13	2.71	0.33	0.38	0.014	0.050	1.69	1.75
0.48	T	1.06	3.15	2.72	0.34	0.39	0.014	0.050	1.73	1.83
0.49	T	1.09	3.17	2.73	0.34	0.40	0.014	0.049	1.77	1.92
0.50	T	1.11	3.19	2.73	0.35	0.41	0.014	0.049	1.80	2.01
0.51	T	1.14	3.21	2.74	0.36	0.42	0.014	0.049	1.84	2.10
0.52	T	1.17	3.23	2.74	0.36	0.43	0.014	0.048	1.87	2.19
0.53	T	1.20	3.26	2.75	0.37	0.44	0.014	0.048	1.91	2.28
0.54	T	1.22	3.28	2.75	0.37	0.44	0.014	0.048	1.94	2.37
0.55	T	1.25	3.30	2.76	0.38	0.45	0.014	0.048	1.97	2.47
0.56	T	1.28	3.32	2.77	0.39	0.46	0.014	0.047	2.01	2.57
0.57	T	1.31	3.34	2.77	0.39	0.47	0.014	0.047	2.04	2.67
0.58	T	1.33	3.36	2.78	0.40	0.48	0.014	0.047	2.07	2.77
0.59	T	1.36	3.38	2.78	0.40	0.49	0.014	0.046	2.11	2.87
0.60	T	1.39	3.40	2.79	0.41	0.50	0.015	0.046	2.14	2.97
0.61	T	1.42	3.42	2.79	0.41	0.51	0.015	0.046	2.17	3.08
0.62	T	1.45	3.44	2.80	0.42	0.52	0.015	0.046	2.20	3.18
0.63	T	1.47	3.46	2.81	0.43	0.53	0.015	0.046	2.23	3.29
0.64	T	1.50	3.48	2.81	0.43	0.53	0.015	0.045	2.26	3.40
0.65	T	1.53	3.51	2.82	0.44	0.54	0.015	0.045	2.29	3.51
0.66	T	1.56	3.53	2.82	0.44	0.55	0.015	0.045	2.32	3.62
0.67	T	1.59	3.55	2.83	0.45	0.56	0.015	0.045	2.35	3.73
0.68	T	1.62	3.57	2.84	0.45	0.57	0.015	0.045	2.38	3.85
0.69	T	1.64	3.59	2.84	0.46	0.58	0.015	0.044	2.41	3.97
0.70	T	1.67	3.61	2.85	0.46	0.59	0.015	0.044	2.44	4.08
0.71	T	1.70	3.63	2.85	0.47	0.60	0.015	0.044	2.47	4.20
0.72	T	1.73	3.65	2.86	0.47	0.60	0.015	0.044	2.50	4.32
0.73	T	1.76	3.67	2.86	0.48	0.61	0.015	0.044	2.53	4.44
0.74	T	1.79	3.69	2.87	0.48	0.62	0.015	0.044	2.56	4.57
0.75	T	1.82	3.71	2.88	0.49	0.63	0.015	0.043	2.58	4.69
0.76	T	1.84	3.73	2.88	0.49	0.64	0.015	0.043	2.61	4.82
0.77	T	1.87	3.76	2.89	0.50	0.65	0.015	0.043	2.64	4.94
0.78	T	1.90	3.78	2.89	0.50	0.66	0.015	0.043	2.67	5.07
0.79	T	1.93	3.80	2.90	0.51	0.67	0.015	0.043	2.69	5.20
0.80	T	1.96	3.82	2.90	0.51	0.67	0.015	0.043	2.72	5.33
0.81	T	1.99	3.84	2.91	0.52	0.68	0.015	0.043	2.75	5.46
0.82	T	2.02	3.86	2.92	0.52	0.69	0.015	0.043	2.77	5.60
0.83	T	2.05	3.88	2.92	0.53	0.70	0.015	0.042	2.80	5.73
0.84	T	2.08	3.90	2.93	0.53	0.71	0.015	0.042	2.83	5.87
0.85	T	2.11	3.92	2.93	0.54	0.72	0.015	0.042	2.85	6.00
0.86	T	2.14	3.94	2.94	0.54	0.73	0.015	0.042	2.88	6.14
0.87	T	2.16	3.96	2.95	0.55	0.73	0.015	0.042	2.90	6.28
0.88	T	2.19	4.03	3.00	0.55	0.73	0.015	0.042	2.90	6.37
0.89	T	2.22	4.09	3.05	0.54	0.73	0.015	0.042	2.91	6.47

bf

bf - thalweg

**********WinXSPRO**********
redondo.out
Input File: C:\WXSPRO20\REDONDO.DAT
Run Date: 07/01/99
Analysis Procedure: Hydraulics
Cross Section Number: 1
Survey Date: 06/28/99

Subsections/Dividing stations
A

Resistance Method: Manning's n

SECTION	A
Low Stage n	0.070
High Stage n	0.050

STAGE (ft)	#SEC	AREA (sq ft)	PERIM (ft)	WIDTH (ft)	R (ft)	DHYD (ft)	SLOPE (ft/ft)	n	VAVG (ft/s)	Q (cfs)
0.29	T	0.55	2.76	2.61	0.20	0.21	0.014	0.070	0.86	0.48
0.30	T	0.58	2.78	2.62	0.21	0.22	0.014	0.070	0.89	0.52
0.31	T	0.61	2.80	2.62	0.22	0.23	0.014	0.069	0.92	0.56
0.32	T	0.63	2.82	2.63	0.22	0.24	0.014	0.069	0.94	0.60
0.33	T	0.66	2.84	2.63	0.23	0.25	0.014	0.069	0.97	0.64
0.34	T	0.68	2.86	2.64	0.24	0.26	0.014	0.068	1.00	0.68
0.35	T	0.71	2.88	2.65	0.25	0.27	0.014	0.068	1.02	0.73
0.36	T	0.74	2.90	2.65	0.25	0.28	0.014	0.068	1.05	0.77
0.37	T	0.76	2.92	2.66	0.26	0.29	0.014	0.067	1.07	0.82
0.38	T	0.79	2.94	2.66	0.27	0.30	0.014	0.067	1.10	0.87
0.39	T	0.82	2.96	2.67	0.28	0.31	0.014	0.067	1.13	0.92
0.40	T	0.84	2.98	2.67	0.28	0.32	0.014	0.066	1.15	0.97
0.41	T	0.87	3.01	2.68	0.29	0.32	0.014	0.066	1.18	1.02
0.42	T	0.90	3.03	2.69	0.30	0.33	0.014	0.066	1.20	1.08
0.43	T	0.92	3.05	2.69	0.30	0.34	0.014	0.065	1.23	1.13
0.44	T	0.95	3.07	2.70	0.31	0.35	0.014	0.065	1.25	1.19
0.45	T	0.98	3.09	2.70	0.32	0.36	0.014	0.065	1.28	1.25
0.46	T	1.01	3.11	2.71	0.32	0.37	0.014	0.064	1.30	1.31
0.47	T	1.03	3.13	2.71	0.33	0.38	0.014	0.064	1.33	1.37
0.48	T	1.06	3.15	2.72	0.34	0.39	0.014	0.064	1.35	1.43
0.49	T	1.09	3.17	2.73	0.34	0.40	0.014	0.063	1.38	1.50
0.50	T	1.11	3.19	2.73	0.35	0.41	0.014	0.063	1.40	1.56
0.51	T	1.14	3.21	2.74	0.36	0.42	0.014	0.063	1.43	1.63
0.52	T	1.17	3.23	2.74	0.36	0.43	0.014	0.062	1.45	1.70
0.53	T	1.20	3.26	2.75	0.37	0.44	0.014	0.062	1.48	1.77
0.54	T	1.22	3.28	2.75	0.37	0.44	0.014	0.062	1.50	1.84
0.55	T	1.25	3.30	2.76	0.38	0.45	0.014	0.061	1.53	1.91
0.56	T	1.28	3.32	2.77	0.39	0.46	0.014	0.061	1.55	1.98
0.57	T	1.31	3.34	2.77	0.39	0.47	0.014	0.061	1.58	2.06
0.58	T	1.33	3.36	2.78	0.40	0.48	0.014	0.060	1.60	2.14
0.59	T	1.36	3.38	2.78	0.40	0.49	0.014	0.060	1.63	2.22
0.60	T	1.39	3.40	2.79	0.41	0.50	0.015	0.060	1.65	2.30
0.61	T	1.42	3.42	2.79	0.41	0.51	0.015	0.060	1.68	2.38
0.62	T	1.45	3.44	2.80	0.42	0.52	0.015	0.059	1.70	2.46
0.63	T	1.47	3.46	2.81	0.43	0.53	0.015	0.059	1.73	2.55
0.64	T	1.50	3.48	2.81	0.43	0.53	0.015	0.059	1.75	2.63
0.65	T	1.53	3.51	2.82	0.44	0.54	0.015	0.058	1.78	2.72
0.66	T	1.56	3.53	2.82	0.44	0.55	0.015	0.058	1.81	2.81
0.67	T	1.59	3.55	2.83	0.45	0.56	0.015	0.058	1.83	2.91
0.68	T	1.62	3.57	2.84	0.45	0.57	0.015	0.057	1.86	3.00
0.69	T	1.64	3.59	2.84	0.46	0.58	0.015	0.057	1.88	3.10
0.70	T	1.67	3.61	2.85	0.46	0.59	0.015	0.057	1.91	3.19
0.71	T	1.70	3.63	2.85	0.47	0.60	0.015	0.056	1.94	3.29
0.72	T	1.73	3.65	2.86	0.47	0.60	0.015	0.056	1.96	3.40
0.73	T	1.76	3.67	2.86	0.48	0.61	0.015	0.056	1.99	3.50
0.74	T	1.79	3.69	2.87	0.48	0.62	0.015	0.055	2.02	3.60
0.75	T	1.82	3.71	2.88	0.49	0.63	0.015	0.055	2.04	3.71
0.76	T	1.84	3.73	2.88	0.49	0.64	0.015	0.055	2.07	3.82
0.77	T	1.87	3.76	2.89	0.50	0.65	0.015	0.054	2.10	3.93
0.78	T	1.90	3.78	2.89	0.50	0.66	0.015	0.054	2.13	4.05
0.79	T	1.93	3.80	2.90	0.51	0.67	0.015	0.054	2.16	4.16
0.80	T	1.96	3.82	2.90	0.51	0.67	0.015	0.053	2.18	4.28
0.81	T	1.99	3.84	2.91	0.52	0.68	0.015	0.053	2.21	4.40
0.82	T	2.02	3.86	2.92	0.52	0.69	0.015	0.053	2.24	4.52
0.83	T	2.05	3.88	2.92	0.53	0.70	0.015	0.052	2.27	4.65
0.84	T	2.08	3.90	2.93	0.53	0.71	0.015	0.052	2.30	4.77
0.85	T	2.11	3.92	2.93	0.54	0.72	0.015	0.052	2.33	4.90
0.86	T	2.14	3.94	2.94	0.54	0.73	0.015	0.051	2.36	5.03
0.87	T	2.16	3.96	2.95	0.55	0.73	0.015	0.051	2.39	5.17
0.88	T	2.19	4.03	3.00	0.55	0.73	0.015	0.051	2.40	5.27
0.89	T	2.22	4.09	3.05	0.54	0.73	0.015	0.050	2.42	5.37

Appendix E: Equation for Determining Mean Annual Runoff for Streams in the Western US

Table 1. Channel and streamflow characteristics at selected gaging stations—Continued

QA, AVERAGE ANNUAL RUNOFF, IN ACRE-FEET; QN, FLOOD DISCHARGE OF SPECIFIC RECURRENCE INTERVAL; N EQUALS 2, 5, 10, 25, 50, OR 100 YEARS, IN CUBIC FEET PER SECOND; PA, AVERAGE ANNUAL PRECIPITATION, IN INCHES; P2-24, 2-YEAR, 24-HOUR PRECIPITATION, IN INCHES.

MAP NO	STATION NO	QA	Q2	Q5	Q10	Q25	Q50	Q100	PA	P2-24
141	1144H500	8980	956	1330	1560	1850	2060	2270	41.0	4.50
142	11444100	62450	4390	7970	10700	14600	17800	21100	30.0	3.00
143	13112000	35650	390	690	910	1190	1390	1590	10.0	1.20
144	13114000	13110	110	170	210	250	280	310	10.0	1.20
145	13207000	1850	52	130	204	326	438	568	14.0	1.30
146	14179000	455700	6260	8890	10700	13100	14900	16700	77.0	3.70
147	14192000	96360							40.0	3.00
148	14193000	205800	3850	5240	6210	7500	8490	9530	87.5	4.90
149	14301500	907100	17400	22600	26000	30100	33200	36300	102.5	5.50
150	14303600	844800	14500	20100	24000	28900	32600	36300	110.0	5.80
151	14305500	1159000	20900	26600	30200	34300	37300	40200	117.7	5.70

sults. In order to develop easily applied equations of general utility, however, the data groupings are intentionally broad and necessarily different for the mean annual runoff and flood-discharge equations.

Users of the equations need to realize that latitude 39° N. and the edges of the Rocky Mountains (fig. 9) are not exact boundaries. These divisions need to be considered transition zones. Because the computed discharge

Table 2. Equations for determining mean annual runoff for streams in western United States.

Flow frequency	Areas of similar regional-runoff characteristics [a/]	Percentage of time having discharge	Channel-material characteristics [b/]	Equation [c/]	Standard error of estimate (percent)	Equation number
Perennial	Alpine	More than 80	Silt-clay and armored	$Q_A = 64W_{AC}^{1.88}$	28	(7)
Intermittent	Plains north of latitude 39°N.	10 to 80	Silt-clay and armored	$Q_A = 40W_{AC}^{1.80}$	50[d/]	(8)
			Sand	$Q_A = 40W_{AC}^{1.65}$	50[d/]	(9)
	Plains south of latitude 39°N.	10 to 80	Silt-clay and armored	$Q_A = 20W_{AC}^{1.65}$	50[d/]	(10)
			Sand	$Q_A = 20W_{AC}^{1.55}$	50[d/]	(11)
Ephemeral	Northern and southern plains and intermontaine areas	6 to 9	Silt-clay and armored	$Q_A = 10W_{AC}^{1.55}$	[e/]	(12)
			Sand	$Q_A = 10W_{AC}^{1.50}$	[e/]	(13)
		2 to 5	Silt-clay and armored	$Q_A = 4.0W_{AC}^{1.50}$	40[d/]	(14)
			Sand	$Q_A = 4.0W_{AC}^{1.40}$	40[d/]	(15)
	Deserts of the Southwest	1 or less	Silt-clay and armored	$Q_A = 0.04W_{AC}^{1.75}$	75[d/]	(16)
			Sand	$Q_A = 0.04W_{AC}^{1.40}$	75[d/]	(17)

[a/] Areas of climatic characteristics shown in figure 9.

[b/] Silt-clay channels--bed material d_{50} less than 0.1 millimeter or bed material d_{50} equal to or less than 5.0 millimeters and bank silt-clay content equal to or greater than 70 percent.

Sand channels--bed material d_{50} = 0.1-5.0 millimeters and bank silt-clay content less than 70 percent.

Armored channels--bed material d_{50} greater than 5.0 millimeters.

[c/] Active-channel width, W_{AC}, in feet; discharge, Q_A, in acre-feet per year.

[d/] Approximate--standard error of estimate of the basic regression equation.

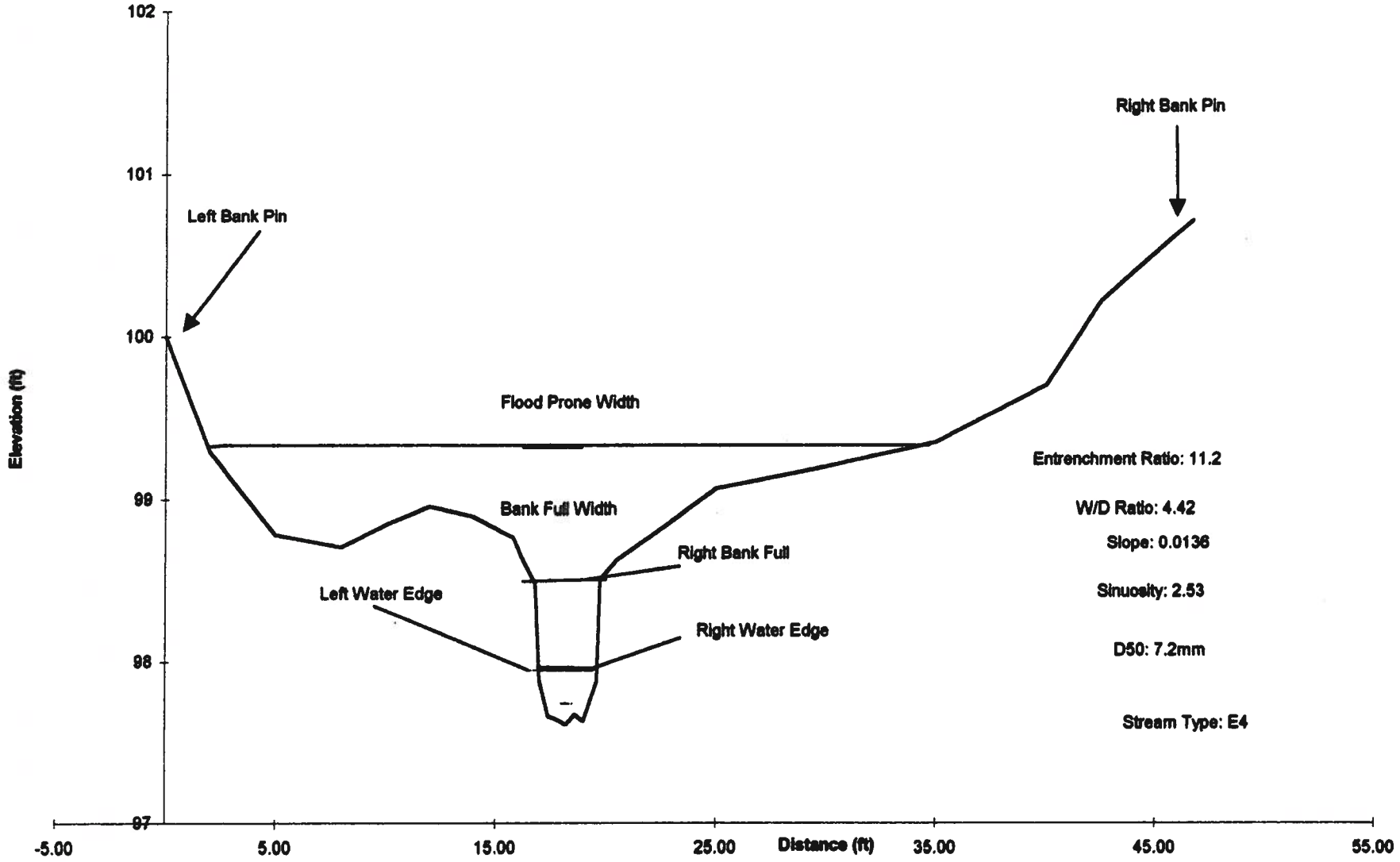
[e/] Standard error of estimate not determined; graphical analyses.

1.0 = 2.0

X 1.4

Appendix F: Redondo Creek Cross Section

Redondo Creek Abv. Sulphur Cr. 6/28/99



THALWAG = the thread of the deepest water; **SINUOSITY** = stream length/valley length or valley slope/channel slope; **ENTRENCHMENT RATIO** = the degree of vertical containment of a river channel (width of the flood prone area at an elevation twice the maximum bankfull depth/bankfull width; **W/D RATIO** = the shape of the channel cross-section (ratio of bankfull width/mean bankfull depth); **SLOPE** = slope of the water surface averaged for 20-30 channel widths

Appendix G: Conversion Factor Determination

8.34 Conversion Factor Derivation

Million gallons/day **x** Milligrams/liter **x** 8.34 = pounds/day

10^6~~gallons~~/day **x** 3.7854 liters/~~1 gallon~~ **x** 10^{-3}gram/liter **x** 1 pound/454 ~~grams~~ = pounds/day

10^6 (10^{-3}) (3.7854)/454 = 3785.4/454

= 8.3379
= **8.34**

Appendix H: POLLUTANT SOURCE(S) DOCUMENTATION PROTOCOL

This protocol was designed to support federal regulations and guidance requiring states to document and include probable source(s) of pollutant(s) in their §303(d) Lists as well as the States §305(b) Report to Congress.

The following procedure should be used when sampling crews are in the field conducting water quality surveys or at any other time field staff are collecting data.

Pollutant Source Documentation Steps:

1). Obtain a copy of the most current §303(d) List.

2). Obtain copies of the ***Field Sheet for Assessing Designated Uses and Nonpoint Sources of Pollution***.

3). Obtain 35mm camera that has time/date photo stamp on it. **DO NOT USE A DIGITAL CAMERA FOR THIS PHOTODOCUMENTATION**

4). Identify the reach(s) and probable source(s) of pollutant in the §303(d) List associated with the project that you will be working on.

5). Verify if current source(s) listed in the §303(d) List are accurate.

6). Check the appropriate box(s) on the field sheet for source(s) of nonsupport and estimate percent contribution of each source.

7). Photodocument probable source(s) of pollutant.

8). Create a folder for the TMDL files, insert field sheet and photodocumentation into the file.

This information will be used to update §303(d) Lists and the States §305(b) Report to Congress.

FIELD SHEET FOR ASSESSING DESIGNATED USES AND NONPOINT SOURCES OF POLLUTION

CODES FOR USES NOT FULLY SUPPORTED

☐	HQCWF	=	HIGH QUALITY COLDWATER FISHERY	☐	DWS	= DOMESTIC WATER SUPPLY
☐	CWF	=	COLDWATER FISHERY	☐	PC	= PRIMARY CONTACT
☐	MCWF	=	MARGINAL COLDWATER FISHERY	☐	IRR	= IRRIGATION
☐	WWF	=	WARMWATER FISHERY	☐	LW	= LIVESTOCK WATERING
☐	LWWF	=	LIMITED WARMWATER FISHERY	☐	WH	= WILDLIFE HABITAT

Fish culture, secondary contact and municipal and industrial water supply and storage are also designated in particular stream reaches where these uses are actually being realized. However, no numeric standards apply uniquely to these uses.

REACH NAME:

SEGMENT NUMBER:

BASIN:

PARAMETER:

STAFF MAKING ASSESSMENT:

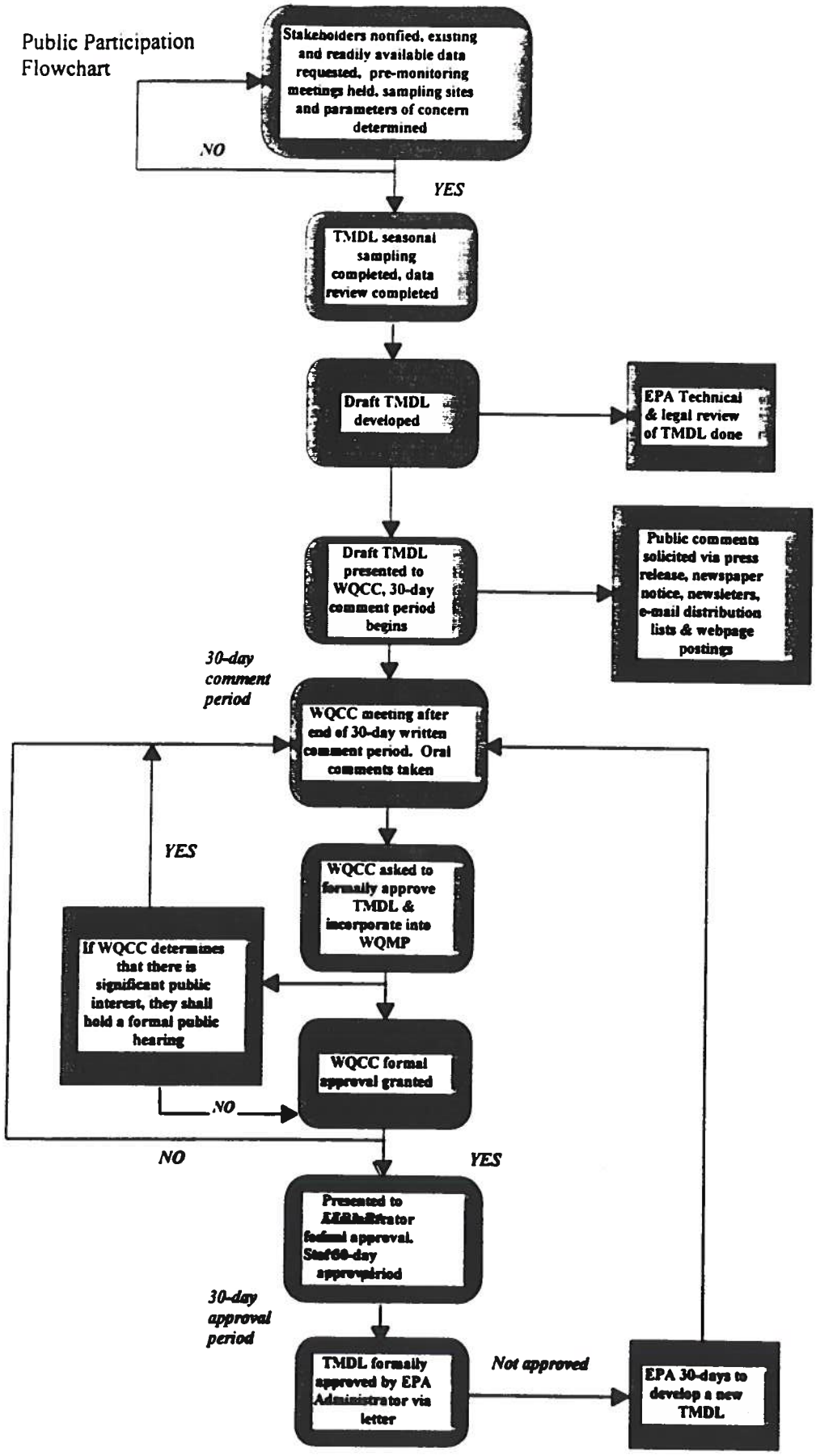
DATE:

CODES FOR SOURCES OF NONSUPPORT (CHECK ALL THAT APPLY)

☐	0100	INDUSTRIAL POINT SOURCES	☐	4000	URBAN RUNOFF/STORM SEWERS	☐	7400	FLOW REGULATION/MODIFICATION
						☐	7500	BRIDGE CONSTRUCTION
☐	0200	MUNICIPAL POINT SOURCES	☐	5000	RESOURCES EXTRACTION	☐	7600	REMOVAL OF RIPARIAN VEGETATION
☐	0201	DOMESTIC POINT SOURCES	☐	5100	SURFACE MINING	☐	7700	STREAMBANK MODIFICATION OR DESTABILIZATION
			☐	5200	SUBSURFACE MINING	☐	7800	DRAINING/FILLING OF WETLANDS
☐	0400	COMBINED SEWER OVERFLOWS	☐	5300	PLACER MINING			
			☐	5400	DREDGE MINING	☐	8000	OTHER
☐	1000	AGRICULTURE	☐	5500	PETROLEUM ACTIVITIES	☐	8010	VECTOR CONTROL ACTIVITIES
☐	1100	NONIRRIGATED CROP PRODUCTION	☐	5501	PIPELINES	☐	8100	ATMOSPHERIC DEPOSITION
☐	1200	IRRIGATED CROP PRODUCTION	☐	5600	MILL TAILINGS	☐	8200	WASTE STORAGE/STORAGE TANK LEAKS
☐	1201	IRRIGATED RETURN FLOWS	☐	5700	MINE TAILINGS	☐	8300	ROAD MAINTENANCE or RUNOFF
☐	1300	SPECIALTY CROP PRODUCTION (e.g., truck farming and orchards)	☐	5800	ROAD CONSTRUCTION/MAINTENANCE 8400	☐	8400	SPILLS
			☐	5900	SPILLS	☐	8500	IN-PLACE CONTAMINANTS
☐	1400	PASTURELAND				☐	8600	NATURAL
☐	1500	RANGELAND	☐	6000	LAND DISPOSAL	☐	8700	RECREATIONAL ACTIVITIES
☐	1600	FEEDLOTS - ALL TYPES	☐	6100	SLUDGE	☐	8701	ROAD/PARKING LOT RUNOFF
☐	1700	AQUACULTURE	☐	6200	WASTEWATER	☐	8702	OFF-ROAD VEHICLES
☐	1800	ANIMAL HOLDING/MANAGEMENT AREAS	☐	6300	LANDFILLS	☐	8703	REFUSE DISPOSAL
☐	1900	MANURE LAGOONS	☐	6400	INDUSTRIAL LAND TREATMENT	☐	8704	WILDLIFE IMPACTS
			☐	6500	ONSITE WASTEWATER SYSTEMS (septic tanks, etc.)	☐	8705	SKI SLOPE RUNOFF
☐	2000	SILVICULTURE				☐	8800	UPSTREAM IMPOUNDMENT
☐	2100	HARVESTING, RESTORATION, RESIDUE MANAGEMENT	☐	6600	HAZARDOUS WASTE	☐	8900	SALT STORAGE SITES
			☐	6700	SEPTAGE DISPOSAL			
☐	2200	FOREST MANAGEMENT	☐	6800	UST LEAKS	☐	9000	SOURCE UNKNOWN
☐	2300	ROAD CONSTRUCTION or MAINTENANCE						
			☐	7000	HYDROMODIFICATION			
☐	3000	CONSTRUCTION	☐	7100	CHANNELIZATION			
☐	3100	HIGHWAY/ROAD/BRIDGE	☐	7200	DREDGING			
☐	3200	LAND DEVELOPMENT	☐	7300	DAM CONSTRUCTION/REPAIR			
☐	3201	RESORT DEVELOPMENT						
☐	3300	HYDROELECTRIC						

Appendix I: Flow Chart of the Public Participation Process

Public Participation Flowchart



State of New Mexico
ENVIRONMENT DEPARTMENT
SURFACE WATER QUALITY BUREAU

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Santa Fe, New Mexico 87502

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Los Alamos
NATIONAL LABORATORY

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

Date: September 9, 1999
In Reply Refer To: ESH-18/WQ&H:99-0356
Mail Stop: K497
Telephone: (505) 665-1859

Mr. David Hogge
New Mexico Environment Department
P.O. Box 26110
Santa Fe, New Mexico 87502

SUBJECT: COMMENTS ON THE DRAFT "TOTAL MAXIMUM DAILY LOADS (TMDLS) FOR THE MIDDLE RIO DE LAS VACAS, REDONDO CREEK, JEMEZ RIVER, AND RIO GUADALUPE

Dear Mr. Hogge:

We appreciate the opportunity to provide comments on the draft "Total Maximum Daily Loads (TMDLs) for the Middle Rio de las Vacas, Redondo Creek, Jemez River, and Rio Guadalupe". The document describes the approach used to calculate the TMDLs for these streams. The following are our specific comments:

The TMDLs for the Middle Rio de las Vacas and Redondo Creek rely on estimates of average flow and critical low flow because there are no appropriately located stage stream gages. There is no question that some type of estimation approach is required in this situation. The method used for the estimation of flow was to: 1) use empirical formulas developed by the USGS is estimate flow based on watershed size and 2) to verify the empirically-derived calculation using a commercial model. Comparing the results of two models does not produce a "verified" number. This method produces estimates of flow using two different computations, but it does not compare either estimate to measured data. A comparison between estimated data and measured data would provide a "verified" number. The situation of having to estimate flow is expected to be more common than having an appropriately located stream gage, so the approach used to estimate flow is important. We suggest that when developing the protocol for estimating flow, there should be flexibility in the approach and measures for evaluating how "good" the estimate is. The type of approach and measures could then be used to develop the Margin of Safety.

The TMDL for the Middle Rio de las Vacas is focused on temperature and uses a model to estimate temperature loads. The origin of the model and how it was selected were not described in the TMDL document. Further, if there was any calibration of the model (i.e. comparison between actual measured values and predicted values), it was not clear from the documentation provided. We encourage the use of models to base TMDLs on, but urge that protocols for using models include the rationale for model selection and appropriate calibration or verification.

The method for assigning the Margin of Safety in all three of the TMDLs appears to be based on estimates of the data quality. As the monitoring data is collected and confidence in the data is increased, will the Margin of Safety be adjusted? Adjustment of the Margin of Safety could be an important aspect in stream segments where the TMDL has a direct effect on point sources.

We appreciate the opportunity to comment on the subject documents and look forward to further opportunities to participate in the TMDL process. If you have any questions regarding these comments. please call Ken Mullen at 667-0818.

Sincerely.

Steven Rae
Group Leader
Water Quality and Hydrology Group

SR:KM/rm

Cy: D. Erickson, ESH-DO, MS K491
C. Nylander, ESH-18, MS K497
K. Mullen. ESH-18, MS K497
M. Saladen. ESH-18, MS K497
M. Alexander, ESH-18. MS K497
J. Canepa. E-ER. MS M992
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K. Agogino, DOE/AL, MS J514
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STATE OF NEW MEXICO
COUNTY OF LOS ALAMOS

AFFIDAVIT OF PUBLICATION

CHRIS DISSINGER, being duly sworn, declares and says that he is the GENERAL MANAGER of the Los Alamos Monitor, a newspaper published and having a general fully paid circulation and second-class postage privilege in the County of Los Alamos, State of New Mexico.

Affiant further states that this newspaper is duly qualified to publish legal notices or advertisements within the meaning of Section 14-11 N.M.S.A., 1978 Compilation and was so qualified at the time of all publications in reference hereto.

Affiant further states that the publication, a copy of which hereto affixed, was published in said paper, in the regular and entire issue of each number of the paper, during the period and time of publication and that the notice was published in the newspaper proper and not in a supplement, for -0- consectutive weeks, the first publication being on the 10th day of August, 1999, and the subsequent publications on —, — and —. 19—.

(Signature)

Subscribed and sworn before me this 13th day of August, 1999.

Notary Public

OFFICIAL SEAL
KIM RODGERS
NOTARY PUBLIC-STATE OF NEW MEXICO
My commission expires:

Attach copy of notice here

My Commission Expires: Nov-01-1999

11-01-99

101 LEGALS

NOTICE OF 30 DAY PUBLIC COMMENT PERIOD FOR DRAFT TMDLs

THE NEW MEXICO ENVIRONMENT DEPARTMENT, SURFACE WATER QUALITY BUREAU ON THE PROPOSED TOTAL MAXIMUM DAILY LOADS (TMDLs) FOR THE MIDDLE RIO DE LAS VACAS, REDONDO CREEK, JEMEZ RIVER AND RIO GUADALUPE

The New Mexico Water Quality Control Commission (WQCC) will hold a regular public meeting at 9:00 A.M. on Tuesday, August 10th, 1999 at the State Capital Building, Room 321, Corner of Paseo de Peralta and Old Santa Fe Trail, Santa Fe, New Mexico. This meeting will provide an update on the TMDL process and proposed adoption by the WQCC of the Rio Chamita and Cimarron Basin TMDLs. This meeting will also be the start of the 30-day public comment period for the Middle Rio de las Vacas (temperature), Redondo Creek (total phosphorus), Jemez River (turbidity and stream bottom deposits) and Rio Guadalupe (turbidity and stream bottom deposits) TMDLs which will end on September 10,1999 at 5:00 P.M. mountain daylight time (MDT). Final Middle Rio de las Vacas, Redondo Creek, Jemez River and Rio Guadalupe TMDLs will be submitted to the Commission for their formal approval at the scheduled public meeting tentatively set for October 12, 1999 at which time public comments will also be accepted. Interested persons may obtain more information from and send written Middle Rio de las Vacas, Redondo Creek, Jemez River and Rio Guadalupe TMDL comments to,David Hogge, TMDL Coordinator, TMDL Development Section, Surface Water Quality Bureau, New Mexico Environment Department, P.O. Box 26110, Santa Fe, New Mexico,87502 or by calling (505) 827-2981 during normal working hours. The draft TMDLs will also be posted on the NMED website (by August 10, 1999), which can be found at:

http://
www.nmenv.state.nm.us

After you access the website, the draft TMDLs can be found in the TMDL Development Section. Hard copies of the draft TMDLs will not be mailed out unless specifically requested by the individual or entity.

If you are an individual with disability and you require a sistance or an auxiliary ai (e.g. sign language interpret ect.) to participate in any a pect of this process, plea call Cliff Hawley by June 1999 at (505) 827-2844 write him at the address give above.

Publishing Date: August 1 1999

JARA
Jemez Area Residents Association

JARA's MISSION

JARA is a non-profit educational organization that informs residents of the Jemez Mountains area of plans, activities and events that may affect their lifestyles, and in turn informs agencies, officials and organizations of the opinions of area residents regarding those plans, activities and events. JARA does not support or oppose any activities and acts only as a liaison for Jemez area residents.

JARA REPORT
Published quarterly for members of the Jemez Area Residents Association (JARA).
Mailing address: JARA, PO Box 184, Jemez Springs, NM 87025.
Telephone: 829-3093
Contributions are welcome. However, we reserve the right to edit all items, or to refuse their publication.
Published by the Board of Directors of JARA.
Editor: John Curran/Tel: 829-3215
FAX: 829-3215
Email: jara@jemez.com
Graphic design: Words Alive
Printed on Recycled Paper

ISSUES UPDATE

JARA is currently monitoring seven issues affecting the area. If you feel that there is an issue that affects the area in general, but is also unique to the area, please let us know about it. Refer to this column for a quick update on the status of these seven issues.

The Baca

The Dunigan family is reported to be showing renewed interest in selling the Baca to the government. The $40 million originally appropriated to help purchase the property has been reappropriated.

Pumice Trucks/Hwy 4

A federal judge has ruled that Copar Pumice Co. has no valid claim on 1,700 acres of land near the east fork of the Jemez River. The ruling is based on the current market for the high quality pumice used to stone wash jeans. Mining claims of federal land must be supported by proof of a market for the substance to be mined. The court ruled that 19 claims by Richard Cook and family, Copar's owners, were invalid because there was more than enough pumice in the existing El Cajete mine site for many years to come, and that it was a dwindling market. Conservationists hope the ruling will lead to invalidation of 80 other Cook family claims in the Jemez.

Jemez Mtn. Trail

The signs designating the Trail are being held up due to a technical problem with their manufacture. A new brochure promoting the Trail should be available shortly. The spending of JMT grant monies for the park in Jemez Springs is the subject of debate between the county, which seems inclined to spend more time and money on design, planning and non-local resources, and area park activists, who would prefer to conserve time and money by using local volunteerism and resources.

"Rails to Trails"

The county awarded a contract for the state-funded $35,000 Rails to Trails feasibility study to Resource Technologies of Albuquerque.

Paving of 126

The state highway department has prioritized projects that qualify for the $5 million plus in federal highway funds that the state receives annually, and it's now estimated that paving of 126 will not begin until 2005 and will be a three- or four-year project, beginning at the Cuba end of the road..

National Recreation Area

Santa Fe National Forest Supervisor, Leonard Atencio, has announced that Alternative B, a moderate variation of the general forest management plan, has been selected from the alternatives offered in the JNRA Environment Assessment and Management Plan published this spring.

Emergency Services

The new Cañon fire substation of the Ponderosa VFD, behind the Community Center, should be operational later this fall.

Would you like to serve?

We're looking for a few community- minded individuals to serve on the 2000 JARA Board of Directors. If you're interested call us at 829-3093, and we'll be happy to place your name in nomination.

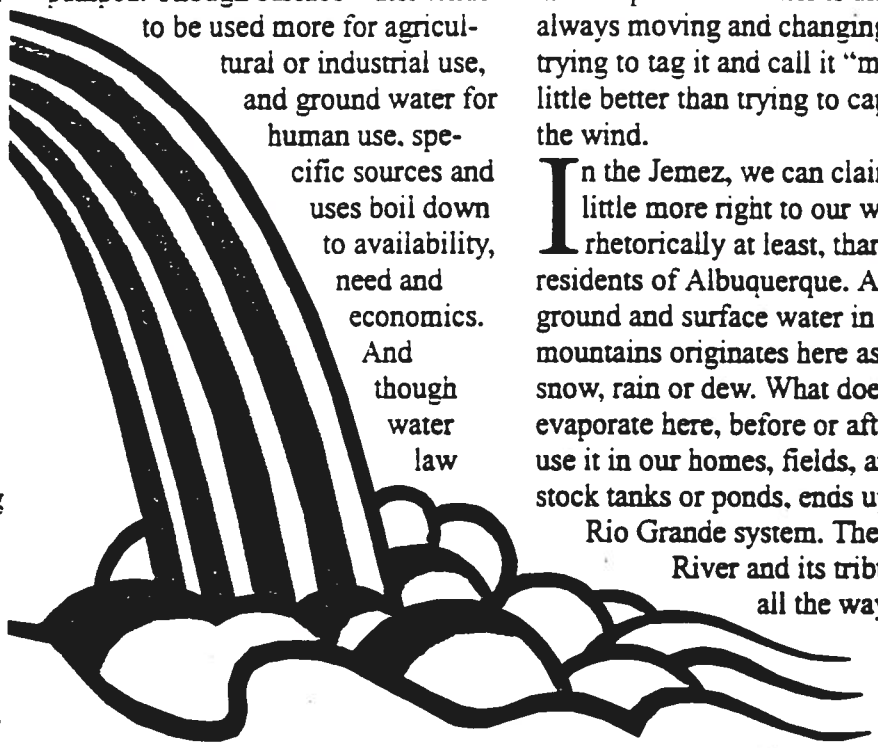
WATER RIGHTS — AND WHAT'S LEFT

Trying to explain water rights in New Mexico is like trying to explain the politics of the Middle East — there are lots of players of varying degrees of power and influence, lots of history and complexity to the issues, and there's a lot at stake from everybody's perspective. And, like the Middle East, everybody tends to get pretty passionate about it. The good news is that, unlike the Middle East, the inevitable conflicts end up in court rather than on the battlefield.

The bad news is that, absent lethal violence (excepting the no doubt not unheard of case of neighbors coming to blows or firing shots over disputed ditch rights), legal wrangling over water rights is a never-ending battle among federal, state, city, corporate, agricultural, American Indian, environmental and private interests. And some of the hundreds of disputes, hearings and suits have been going on for decades.

While water rights are sometimes described as analogous to land ownership, the fact that water has significantly different properties from dirt (unless they're both kept in a jar) is a large part of the reason for all of the contention. Water flows and evaporates and is easily corrupted. Buy an acre of land and, with a little surveying and a title search, you pretty much know what you've got. Buy an acre foot of water rights and, aside from how an acre foot is measured, things can get real murky.

To understand water rights — and it behooves everyone in the Jemez to have a basic understanding for reasons beyond just our occasional water shortages — a little water rights hydrology is required. Water sources are categorized as either surface or ground water. Surface water, as you might guess, is water from lakes, rivers and streams. Ground water, therefore, is water below the surface, that must be drilled for and may have to be pumped. Though surface water tends to be used more for agricultural or industrial use, and ground water for human use, specific sources and uses boil down to availability, need and economics. And though water law



makes much of the difference between surface and ground water, the realities of physical hydrology are far less distinct. You can make as many definitions and measurements as you like, but the fact is that the specific amount of water at a specific place and time is as unpredictable as the weather. And surface water and ground water tend to intermix. In places where the water table (the uppermost level of water saturation under the ground) rises to or exceeds the lower level of a body of surface water, the pumping of ground water can lower the level of the surface body. And vice versa. And obviously the pumping of ground water on one person's property can dramatically affect the availability of water for neighbors near and far.

Though, to varying degrees, water is returned to the area aquifer through septic leaching fields and return irrigation ditches, water is also lost to evaporation, to return as rain but probably somewhere far to the east. The fact is that the earth's water system is a dynamic process of evaporation, precipitation, drainage and evaporation. Water is almost always moving and changing, and trying to tag it and call it "mine" is little better than trying to capture the wind.

In the Jemez, we can claim a little more right to our water, rhetorically at least, than say residents of Albuquerque. All of the ground and surface water in these mountains originates here as either snow, rain or dew. What doesn't evaporate here, before or after we use it in our homes, fields, and stock tanks or ponds, ends up in the Rio Grande system. The Jemez River and its tributaries, all the way up to the Rio de las Vacas near Cuba, is considered to be part of the Rio Grande Ground Water Basin, which means that a whole lot of other people are interested in our water.

A couple of months ago I attended a presentation by the Middle Rio Grande Water Assembly at the Cañon Community Center. It seems they're a private non-profit group interested in water conservation problems in the future of what boils down to the Albuquerque metropolitan area. I listened as patiently as I could to their presentation, though much of it seemed to be based on fairly common knowledge if you watched the news at all. Yes, Albuquerque had overestimated the extent of their aquifer and was using it up faster than it could be replaced. I got a little perturbed when they started telling us how important it was to conserve water. Yes, yes, we would certainly have to

Continued next page

WATER RIGHTS — AND WHAT'S LEFT

Continued from page 3

cut back on watering the greens at all the golf courses up here. Maybe we could xeriscape the National Forest. Now what about the Jemez? They had no details on the Jemez hydrology or water rights. They did hint that things might get so bad that some day the state might come up here to restrict our water use because of Albuquerque's problem.

A few weeks later I attended a presentation by the New Mexico Environment Department at the Jemez Springs village offices. After a brief introduction they launched into a technical explanation that only a scientist could love of their studies and recommendations regarding "total maximum daily loads" for sections of three area streams. Whoa, I said. Tell me again who you are, what you're here for and what the result of this will be? It seems the federal government, as part of the Clean Water Act, looks for surface water that may be environmentally degraded for one reason or another. The feds then tell the state that they need to clean up their act. The NM Environment Department does studies and, unless the problem is something specific like industrial pollution, makes recommendations to property holders along the affected body of water. They can also award federal matching funds to help make the recommended improvements. Any real authority to demand their recommendations be met? No. But they hinted that the feds might come up here to do something someday if problems continued.

There seem to be a lot of groups and agencies like this in the Southwest. Lots of interest and information but little or no power to actually impact the availability and use of water in the Jemez. So who does have the power? The Office of the State Engineer (OSE). A political appointee of the Governor, the State Engineer is charged with protecting and allocating the state's water. He is the *majordomo* of water in New Mexico. His office determines who has the rights to any surface water in the state. His office also determines who has the rights to ground water in any area in the state that his office has categorized as a "ground water basin." Most of the state, including all of the Jemez, is categorized as part of a ground water basin. So for the most part, whether you want to use water out of the river or out of a well, it's at the discretion of the State Engineer.

"...the real question is: when will the rest of New Mexico come knocking with empty water buckets in hand?"

And things aren't that simple. For one thing, the Engineer doesn't have all of the water in the state to allocate. Remember that water is a dynamic entity and the Rio Grande (of which our water is a part) is a classic example. It starts in Colorado and passes through New Mexico and along the Texas-Mexico border on its way to the Gulf. A compact between New Mexico, Colorado and Texas, and a treaty with Mexico, obligates New Mexico to deliver so many gallons of the Rio Grande downstream. As demographics in the Southwest change, these agreements become stressed.

On the other end of the scale are the water rights of individual water users and a lot of history and tradition. Before the Spanish invaded New Mexico, the Pueblos were using gravity fed ditch systems to divert water from surface bodies to their fields. The Spanish were familiar with this irrigation system from the arid lands of Spain, and so they used similar systems and imposed their management on the territory. That system survives to this day and is a significant part of New Mexico water law and culture.

A manmade ditch that diverts water from a surface water body such as the Jemez or the San Antonio is called an *acequia*. The term sometimes is applied more generally to the ditch management association that administers that ditch and its incumbent ditch system. Each acequia is governed by a mayordomo (Spanish for majordomo, or "domestic steward") and three commissioners. They must be water right holders of that ditch and are elected by all water right holders on that ditch. They have the responsibility of seeing that the system is maintained by assigning tasks and fees to members, and they ensure that members receive their proper distribution of water.

It's important to understand the role acequias play in New Mexico's history, culture and economy — including its present day economy. To this day many New Mexicans rely on acequias to water their fields and stock, providing food and income for their families. But many landowners who are new to the state, or have moved from the city to a rural setting, have no use for or understanding of the acequia system and its importance to some of their neighbors. They may not realize that when they purchased their property they may have acquired "ditch" rights for a certain number of acre feet of irrigation water per year (the amount of water it takes to fill an acre one foot deep — more than 300,000 gallons) they can use per year. Property owners in the Jemez have been known to use valuable water co-

Continued on page 6

WATER RIGHTS — AND WHAT'S LEFT

Continued from page 4

op water to water gardens when they should have been exercising ditch water rights.

Ditch water rights have monetary value (currently over $4,000 per acre foot), and the ditches on the property involve responsibilities. If a ditch has been used by the acequia at any time during the past five years and its flow serves other owners' properties, the property owner must consider it a public easement. The property owner must, by state law, allow access to the ditch for maintenance. The property owner can relocate the ditch on the property, but it must retain its flow capacity to subsequent properties.

There are more than two dozen acequias from SanYsidro to the Rio de las Vacas, but Tom Abouselman, lifelong area resident and acequia official, says that some of these ditches are no longer in use.

Water rights in New Mexico have titles much like land, and like land title in New Mexico, water rights title can be difficult to trace. Many of the water rights titles claimed by New Mexicans are under review by the Office of the State Engineer and many will probably be rejected. Water rights that were thought to remain with a family's property sometimes had actually been sold years before. Or water that had been used for years, even generations, may never have been officially awarded or recorded as a water right. Acequia water rights have lineages that go back hundreds of years. Those in the Jemez are dated back to the 1800s though obviously the Jemez Pueblo used ditch irrigation long before that. The treaty rights of American Indians play an important role in water rights adjudication.

Present day water rights, however, encompass much more than ditch irrigation and farming. Unless located in one of the few areas not designated as a ground water basin in New Mexico, anyone who drills a well and taps ground water must have the approval of the OSE. Every gallon of water pumped by a municipal or cooperative water supply company is pumped under permit from the OSE. As the state's water supply becomes more taxed, the OSE is more inclined to require water companies to purchase water rights from others before they can increase their water use. Industrial and corporate users are typically required to purchase water rights in order to pump water.

In the Jemez, property owners who are not on a water cooperative system and not on an acequia, must drill for their water. Even those with acequia rights probably prefer well water for their house. So long as the water tapped is to be for personal consumption and personal irrigation of landscapes of not more than one acre, the property owner will not be required to purchase water rights. Any commercial use of water requires water rights which must typically be purchased from other area water rights holders. Regardless of how you intend to use the water you must receive a permit from the OSE to drill a well. Unless you intend to dig your well by hand (whew!) the method of drilling and type of well must meet state requirements and only drilling companies licensed by the OSE can drill water wells. Drinking water quality is the purvue of the health department, not the OSE.

Governments in New Mexico began granting water rights long before anyone had the foggiest idea how much water there was to be granted. Do today's water rights total acre feet relate to the total water available in the state? Do they in the Jemez? Even today, hydrology is an inexact science, water demands from both within and without the state are increasing, and water continues to have a mind of its own. Just within the microcosm of our own area, water rights are in question and disputes are in the courts. But the real question is: when will the rest of New Mexico come knocking with empty water buckets in hand?

— Bruce Crozier

Sandoval County Community Services

Continued from page 5

for the entire county. (At press time we also learned that P&Z and County Addressing were to be separated from Community Services and elevated to division level.) Community Services serves a very large, very fast growing, and very diverse county with limited resources. How qualified will the new director be to judge the special circumstances of the Jemez versus Corrales or Councilor?

And the complexities of today's Jemez will require some extra study. Outgoing Director Mirabal recently got the go-ahead from the County Commission to award a contract for a state-funded $35,000 feasibility study of the Rails to Trails project (see the Spring '99 Report), a project that offers virtually no benefit to the area, and will face significant opposition from communities along its proposed route. Mirabal felt that the contractor would provide useful information about the area, though two previous studies related to the Jemez Mountain Trail and costing $100,000 provided little worthwhile information. There's a much cheaper and more effective way for the county to learn about the problems, needs and opinions of area residents. Ask.

— Bruce Crozier

(PRESS RELEASE)

NOTICE OF COMMUNITY MEETING FOR DRAFT TOTAL MAXIMUM DAILY LOADS (TMDLs)

THE NEW MEXICO ENVIRONMENT DEPARTMENT, SURFACE WATER QUALITY BUREAU ON THE PROPOSED TOTAL MAXIMUM DAILY LOADS (TMDLs) FOR THE MIDDLE RIO DE LAS VACAS, REDONDO CREEK, JEMEZ RIVER AND RIO GUADALUPE

The New Mexico Environment Department, Surface Water Quality Bureau (NMED/SWQB) has scheduled a community meeting from 6:30 P.M. to 8:30 P.M. on Thursday, August 19th, 1999 at the City of Jemez Springs Municipal Offices, 46 Jemez Springs Park Plaza. This meeting will provide for public input on the draft TMDLs for the above mentioned creeks.

A TMDL is a means for **recommending** controls needed to meet water quality standards in a particular water or watershed. TMDLs also contain specific goals for a given water or watershed. Establishing a TMDL is an important step in watershed protection because it sets quantified goals for water quality conditions that may then determine what actions are needed to restore or protect the health of the waterbody.

The following is a list of the pollutants of concern:

Middle Rio de las Vacas exceeded the State surface water quality standard for temperature.
Redondo Creek exceeded the State surface water quality standard for total phosphorus.
Jemez River exceeded the State surface water quality standard for turbidity (as total suspended solids or TSS) and stream bottom deposits (sediment),
Rio Guadalupe exceeded the State surface water quality standard for turbidity (as total suspended solids or TSS) and stream bottom deposits (sediment)

Interested persons may obtain more information from and send written TMDL comments to **David Hogge, TMDL Coordinator, TMDL Development Section, Surface Water Quality Bureau, New Mexico Environment Department, P.O. Box 26110, Santa Fe, New Mexico, 87502 or by calling (505) 827-2981** during normal working hours. The draft TMDLs will also be posted on the NMED website (by August 10, 1999), which can be found at:

http://www.nmenv.state.nm.us

After you access the website, the draft TMDLs can be found in the TMDL Development Section. Hard copies of the draft TMDLs will not be mailed out unless specifically requested by the individual or entity.

NOTICE OF 30 DAY PUBLIC COMMENT PERIOD FOR DRAFT TMDLs

THE NEW MEXICO ENVIRONMENT DEPARTMENT, SURFACE WATER QUALITY BUREAU ON THE PROPOSED TOTAL MAXIMUM DAILY LOADS (TMDLs) FOR THE MIDDLE RIO DE LAS VACAS, REDONDO CREEK, JEMEZ RIVER AND RIO GUADALUPE

The New Mexico Water Quality Control Commission (WQCC) will hold a regular public meeting at 9:00 A.M. on Tuesday, August 10th, 1999 at the State Capitol Building, Room 321, Corner of Paseo de Peralta and Old Santa Fe Trail, Santa Fe, New Mexico. This meeting will provide an update on the TMDL process and proposed adoption by the WQCC of the Rio Chamita and Cimarron Basin TMDLs. This meeting will also be the start of the 30-day public comment period for the Middle Rio de las Vacas (temperature), Redondo Creek (total phosphorus), Jemez River (turbidity and stream bottom deposits) and Rio Guadalupe (turbidity and stream bottom deposits) TMDLs which will end on September 10, 1999 at 5:00 P.M. mountain daylight time (MDT). Final Middle Rio de las Vacas, Redondo Creek, Jemez River and Rio Guadalupe TMDLs will be submitted to the Commission for their formal approval at the scheduled public meeting tentatively set for October 12, 1999 at which time public comments will also be accepted. Interested persons may obtain more information from and send written Middle Rio de las Vacas, Redondo Creek, Jemez River and Rio Guadalupe TMDL comments to. **David Hogge, TMDL Coordinator, TMDL Development Section, Surface Water Quality Bureau, New Mexico Environment Department, P.O. Box 26110, Santa Fe, New Mexico, 87502 or by calling (505) 827-2981** during normal working hours. The draft TMDLs will also be posted on the NMED website (by August 10, 1999), which can be found at:

http://www.nmenv.state.nm.us

After you access the website, the draft TMDLs can be found in the TMDL Development Section. Hard copies of the draft TMDLs will not be mailed out unless specifically requested by the individual or entity.

If you are an individual with a disability and you require assistance or an auxiliary aid, (e.g. sign language interpreter etc.) to participate in any aspect of this process, please call Cliff Hawley by June 1, 1999 at (505) 827-2844 or write him at the address given above.

Appendix J: Response to Comments

Leonard Atencio, Forest Supervisor, Santa Fe National Forest, Santa Fe, NM *Received 9/09/99*

C: Cover Page: The Ecoregion of "Southern Rockies" needs to be referenced.

R: The ecoregion "Southern Rockies" has been referenced.

C: Page 2 Last Two Sentences: A conclusion of this document appears to be that total phosphorus concentration in Redondo Creek can not be linked to sediment loading. Is there a possibility that in this area of volcanic soils, phosphorus may be from natural sources and may never attain state standards?

R: There is a possibility that the total phosphorus concentrations may be from natural sources, however, elk and other wildlife are found throughout the watershed. These animals can represent a potentially important source of phosphate contributions. Animal waste can directly impair water quality through bacterial contamination and increasing nutrient levels. The majority of the watershed (approximately 93%) drains private land. Domestic livestock grazing occurs throughout the watershed, which may contribute to phosphate loading.

C: Page 5: Section on Flow: Flow data is critical to the determination of measured and target loads. While modeling based on cross-sections is adequate for target loads, actual flow data would more accurately represent measured loads. Instrumentation is available that can read flow at the time samples are taken. Such real time readings provide data that represents actual conditions and is preferable to estimated or modeled flow.

R: Redondo Creek does not have any USGS gaged streamflow data on its reach. We agree that actual flow data would more accurately represent measured loads. However, when the water quality samples were taken for Redondo Creek, no flow measurements were taken during any of the sampling periods. Therefore, average discharge was estimated for Redondo Creek utilizing hydraulic geometry dimensions of the active stream channel. The calculation of average discharge was accomplished using the two methodologies described in this document (USGS 1982) and the WINXSPRO software model (USFS 1998).

Flow data using a standard flow meter and cross sectional data were taken for Redondo Creek in July 1999 to estimate the accuracy of the WINXSPRO model and USGS (1982) equation to predict flow. The flow data for Redondo Creek taken in July 1999 was then compared to the modeled flow from WINXSPRO. The accuracy of the model was within 14% of the actual flow data taken for Redondo in July 1999.

For the 1999 sampling season where USGS gaged streamflow data are not available, the SWQB is now conducting flow measurements using a standard flow meter at our water quality stations throughout New Mexico. This practice of taking flow measurements at ungaged stations will continue to be coordinated with our water sampling surveys.

Steven Rae, Group Leader, Water Quality and Hydrology Group, Los Alamos National Laboratory, Los Alamos, NM *Received 9/09/99*

C: The TMDLs for the Middle Rio de Las Vacas and Redondo Creek rely on estimates of average flow and critical low flow because there are no appropriately located stage stream gages. There is no question that some type of estimation approach is required in this situation. The method used for the estimation of flow was to: 1) use empirical formulas developed by the USGS is estimate flow based on watershed size and 2) to verify the empirically-derived calculation using a commercial model. Comparing the results of the two models does not produce a "verified" number. This method produces estimates of flow using two different computations, but it does not compare either estimate to measured data. A comparison between estimated data and measured data would provide a "verified" number. The situation of having to estimate flow is expected to be more common than having an appropriately located stream gage, so the approach used to estimate flow is important. We suggest that when developing the protocol for estimating flow, there should be flexibility in the approach that measures for evaluating how "good" the estimate is. The type of approach and measures could then be used to develop the Margin of Safety.

R: As stated in the previous question, flow data using a standard flow meter and cross sectional data was taken for Redondo Creek in July 1999 to estimate the accuracy of the WINXSPRO model and the USGS (1982) model to predict flow. The flow data for Redondo Creek taken in July 1999 was then compared to the modeled flow from WINXSPRO and the estimated mean average discharge using the USGS (1982) equation. The accuracy of the WINXSPRO model was within 14% of the actual flow data taken for Redondo in July 1999. Utilizing the USGS (1982) equation, the standard error of estimated mean average discharge is 28%. These accuracy factors in calculating flow were taken into account when developing the margin of safety.

C: The method for assigning the Margin of Safety in all three of the TMDL s appears to be based on estimates of the data quality. As the monitoring data is collected and confidence in the data is increased, will the Margin of Safety be adjusted? Adjustment of the Margin of Safety could be an important aspect in stream segments where the TMDL has a direct effect on point sources.

R: The margin of safety will be adjusted as the confidence in the data is increased. The SWQB agrees that the margin of safety (MOS) plays a role in the quantification of the TMDL. The SWQB is preparing a protocol that will explain the quantification of the MOS in TMDL documents. The MOS is adjusted in the TMDL documents as data collection and confidence increases.

RIO de las VACAS, JEMEZ RIVER, RIO GUADALUPE AND REDONDO CREEK TMDLs COMMUNITY MEETING, JEMI
SPRINGS, NEW MEXICO, MUNICIPAL OFFICES
AUGUST 19, 1999 6:30 – 8:30 PM
*****PLEASE PRINT ALL INFORMATION*****

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Emmett Carter	Jemez Springs Domestic Water Coop Cuba Soil & Water Conservation Dist	P.O. Box 43 Jemez Springs 87025	505 829 3467	
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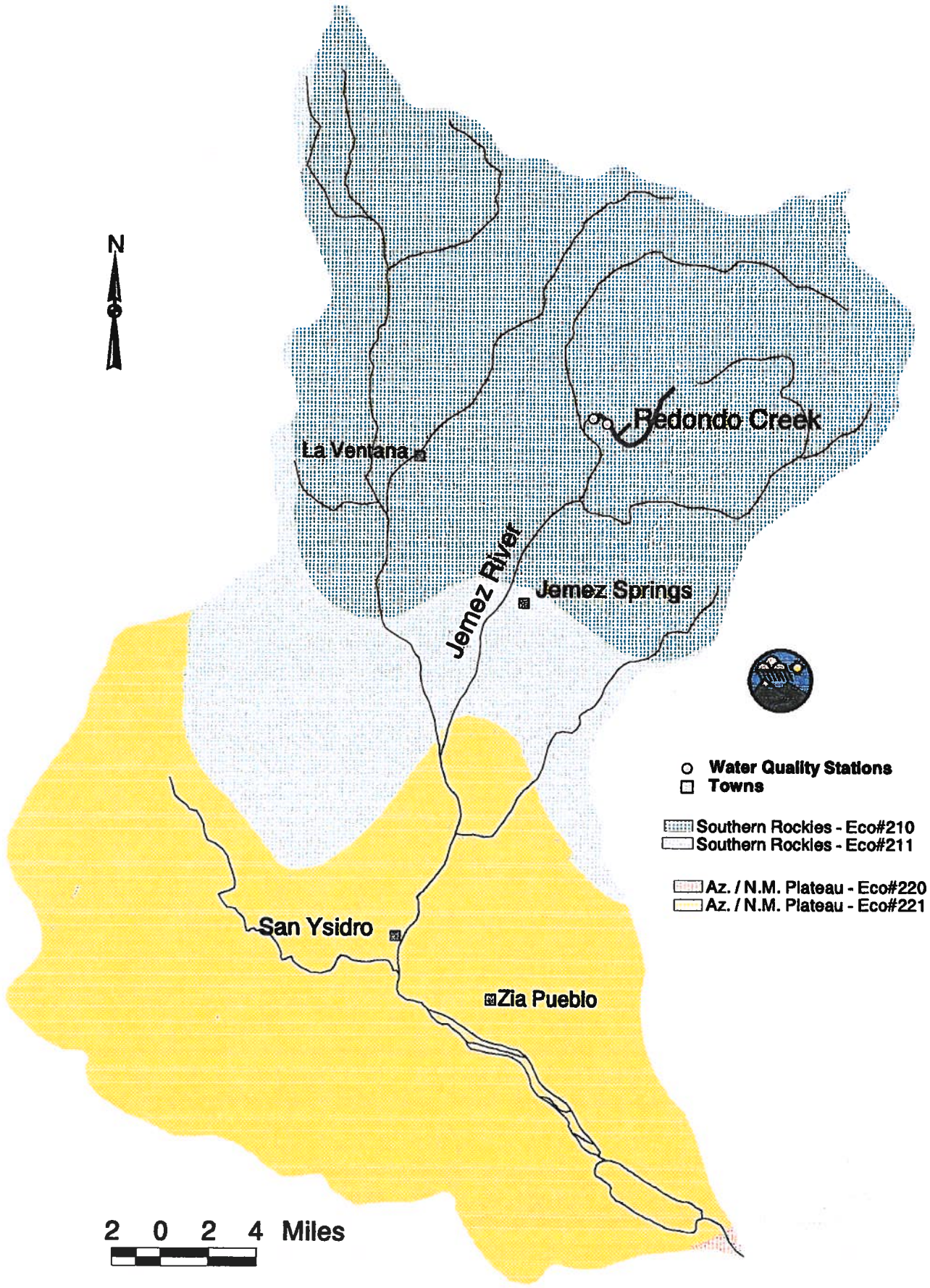
Jemez Watershed



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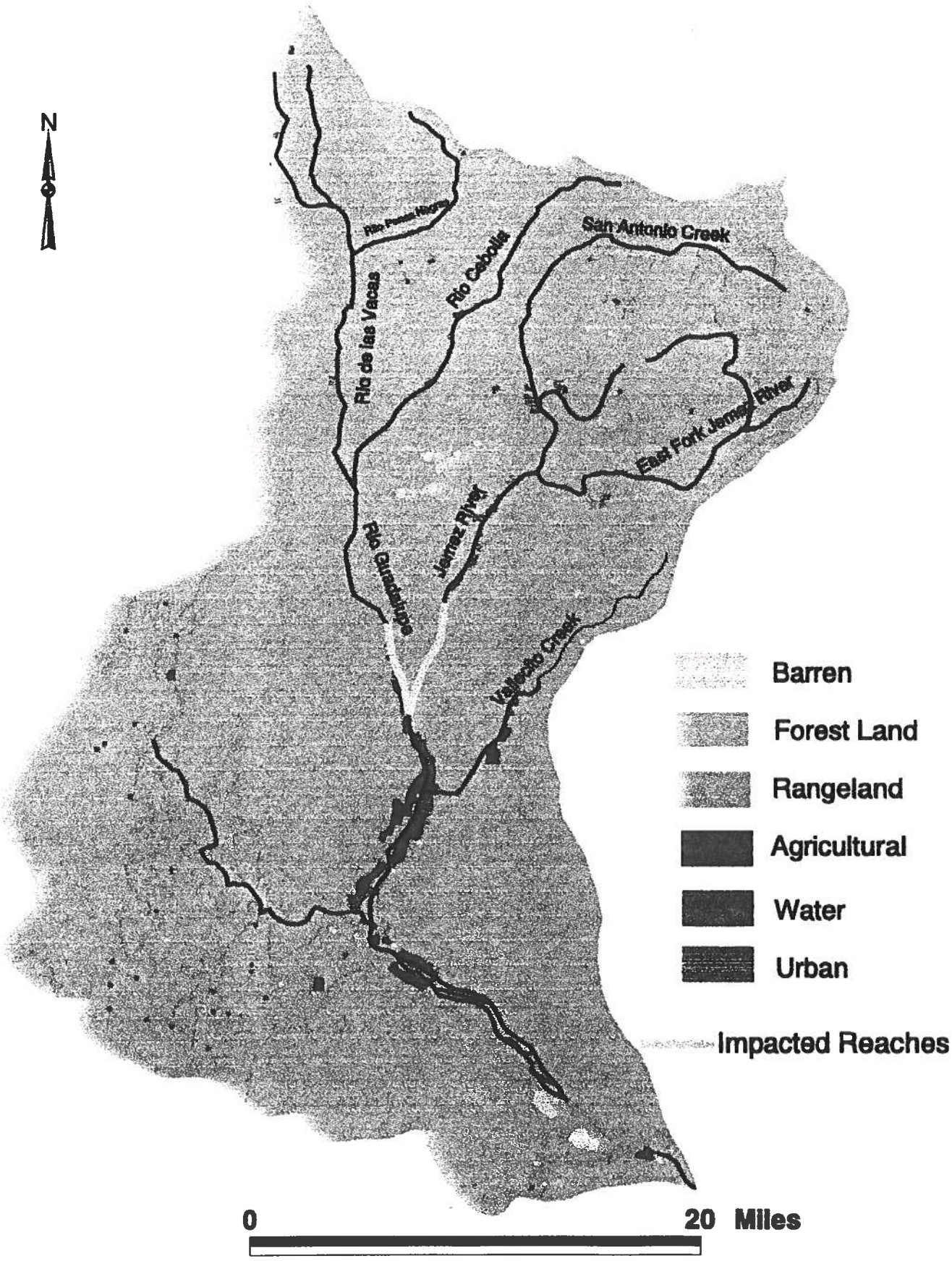
Land Use/Cover



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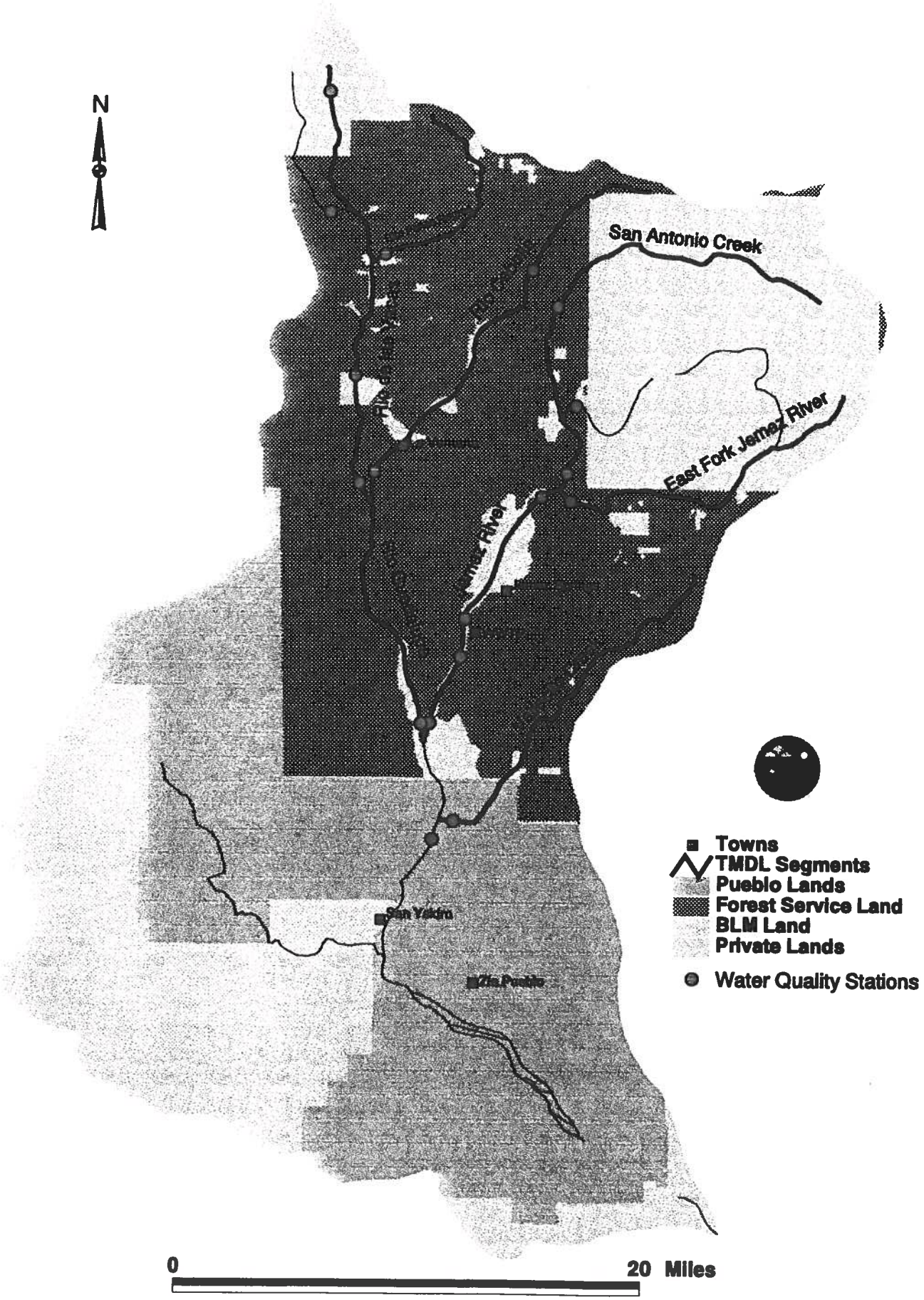

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